

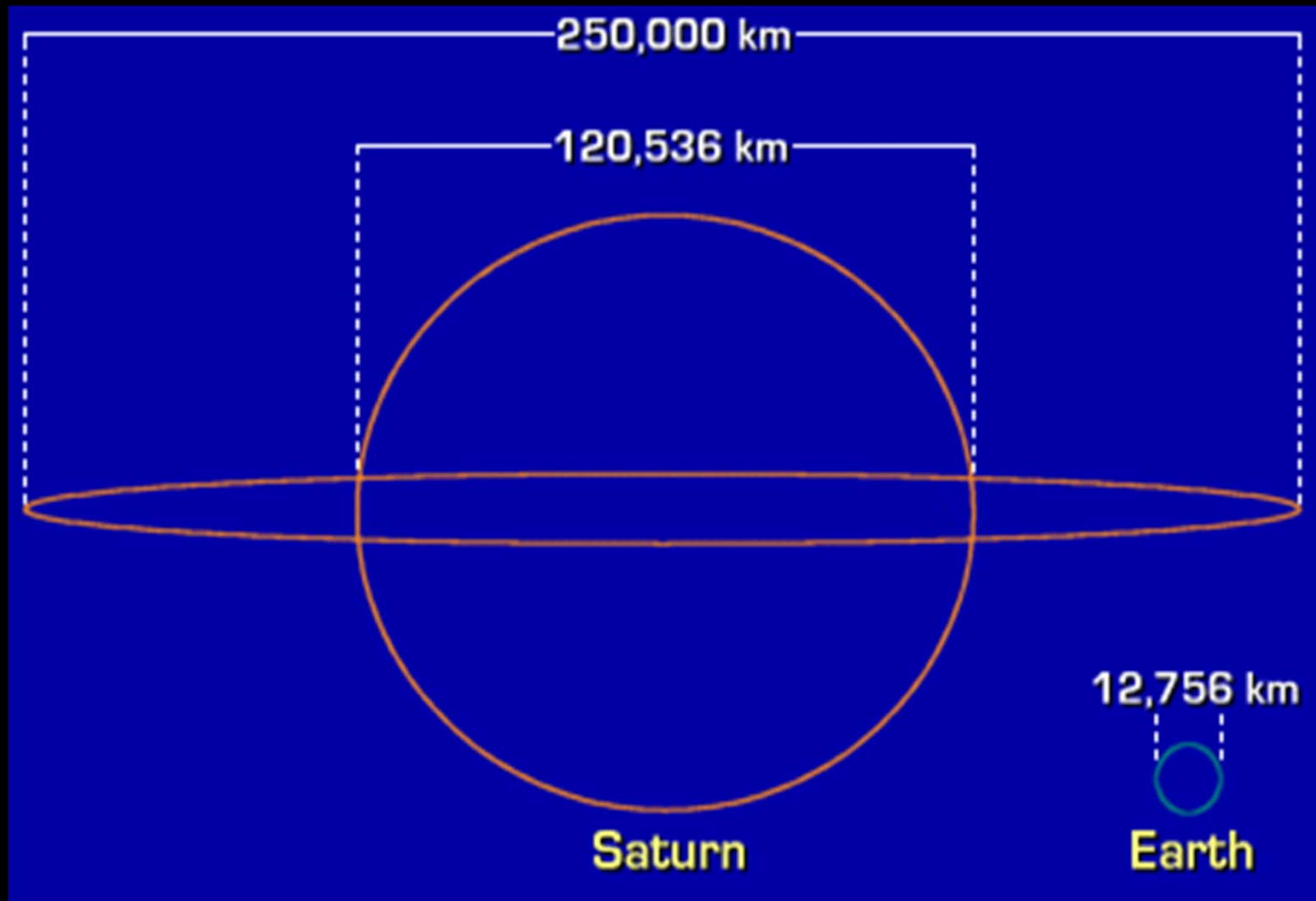
National Aeronautics and Space Administration



Cassini—Unlocking Saturn's Secrets

www.nasa.gov

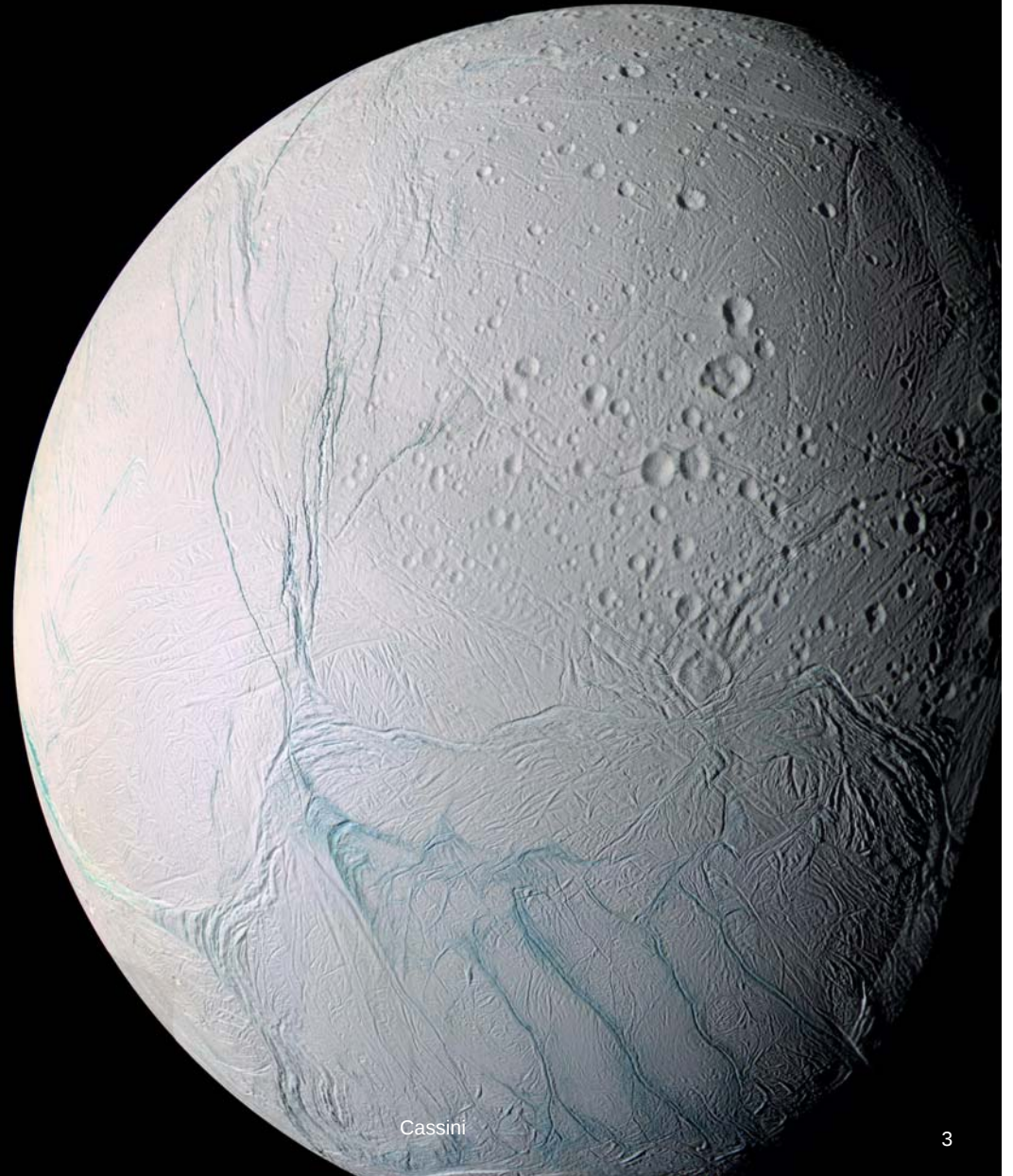
Saturn



Titan

**Saturn's
largest Moon**

**2nd largest in
the solar
system**





Why Saturn?

*Cassini
Science
Objective*

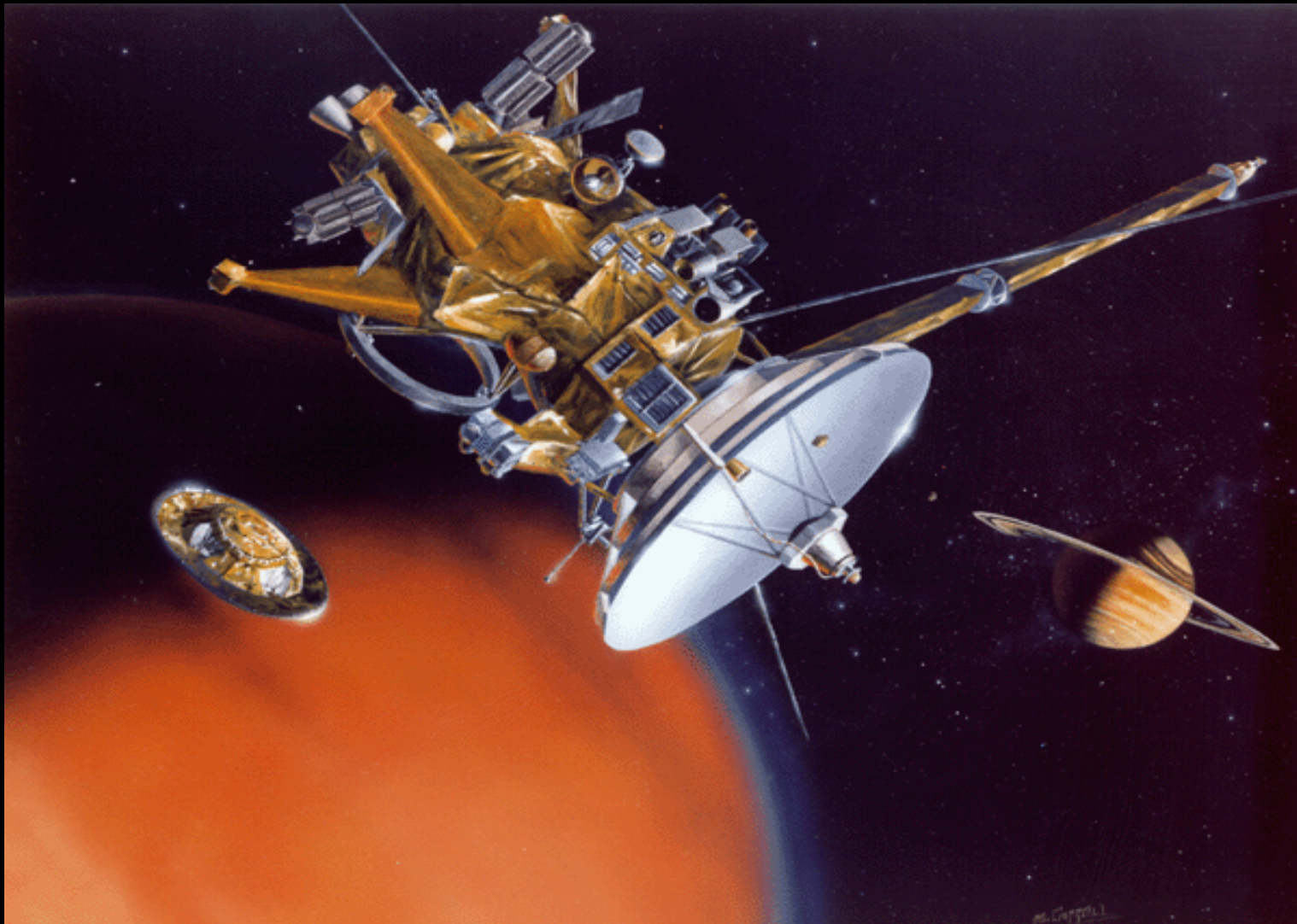
Why Titan?

Huygens Science Objective



Cassini Mission

- **Launched 10-15-97 from CCAS on a Titan IV-B**
- **Arrived to Saturn: July 1, 2004 (traveled 2 billion miles)**
- **Mission was scheduled to end: June 30, 2008**



Cassini & Huygens Probe

Key Facts

HUYGENS PROBE

Mass	350 kg
Height	2.7 m
Mission duration	2 hours and 30 minutes
Onboard experiments	6

CASSINI ORBITER

Mass	5,300 kg
Height	6.8 m
Mission duration	4 years
Orbit	Variable
Onboard experiments	12

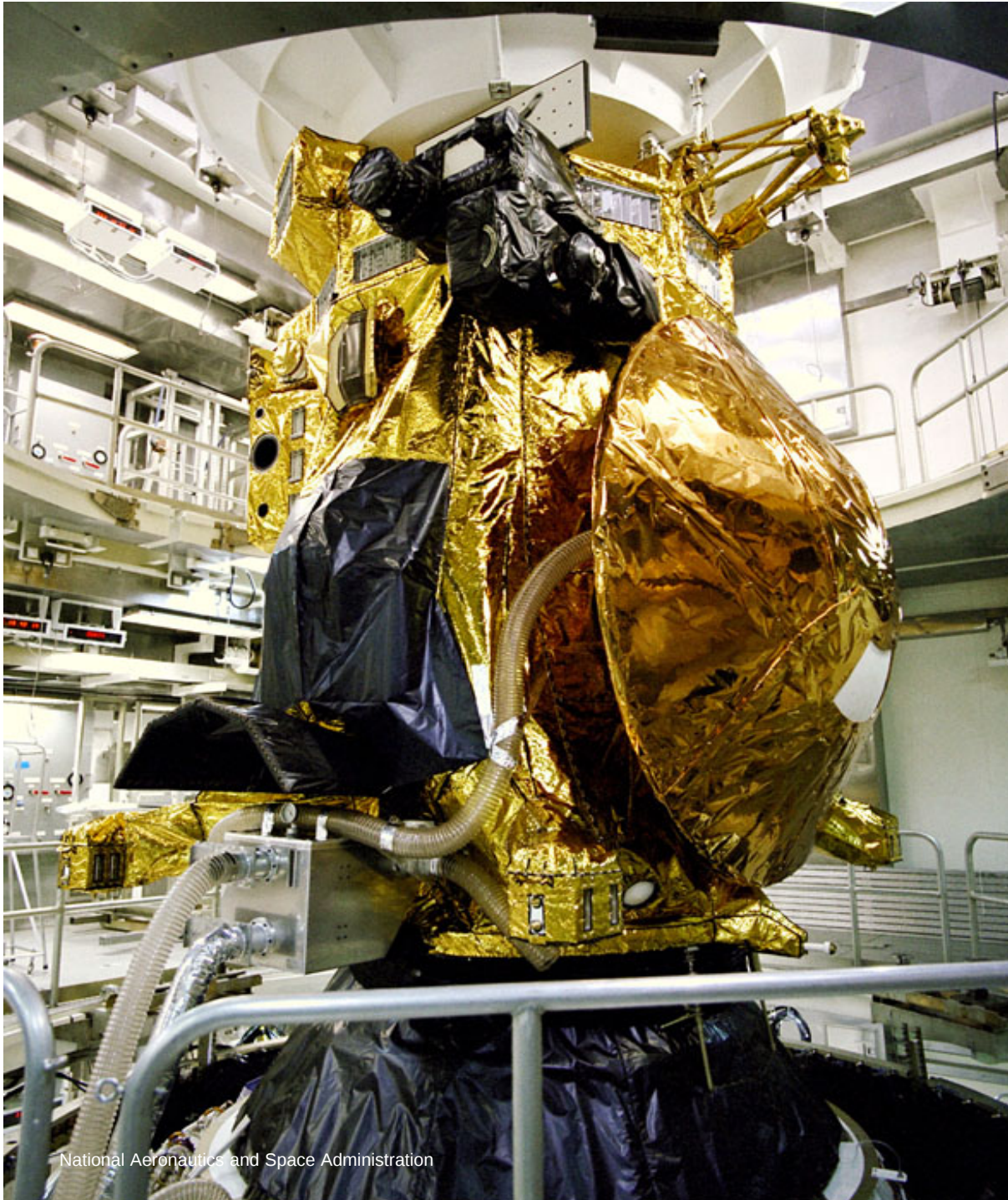
**Orbiter & Probe Mass:
5655 Kg (12,470 lbs- ~6.2 tons)**



RTGs are the spacecraft power systems that provide power through the natural radioactive decay of plutonium (mostly Pu-238, a non-weapons-grade isotope). The heat generated by this natural process is changed into electricity by solid-state thermoelectric Converters

The United States has an outstanding record of safety in using RTGs on 24 missions over the past three decades.

More than 30 years have been invested in the engineering, safety analysis and testing of RTGs. Safety features are incorporated into the RTGs' design, and extensive testing has demonstrated that they can withstand physical conditions more severe than those expected from most accidents.

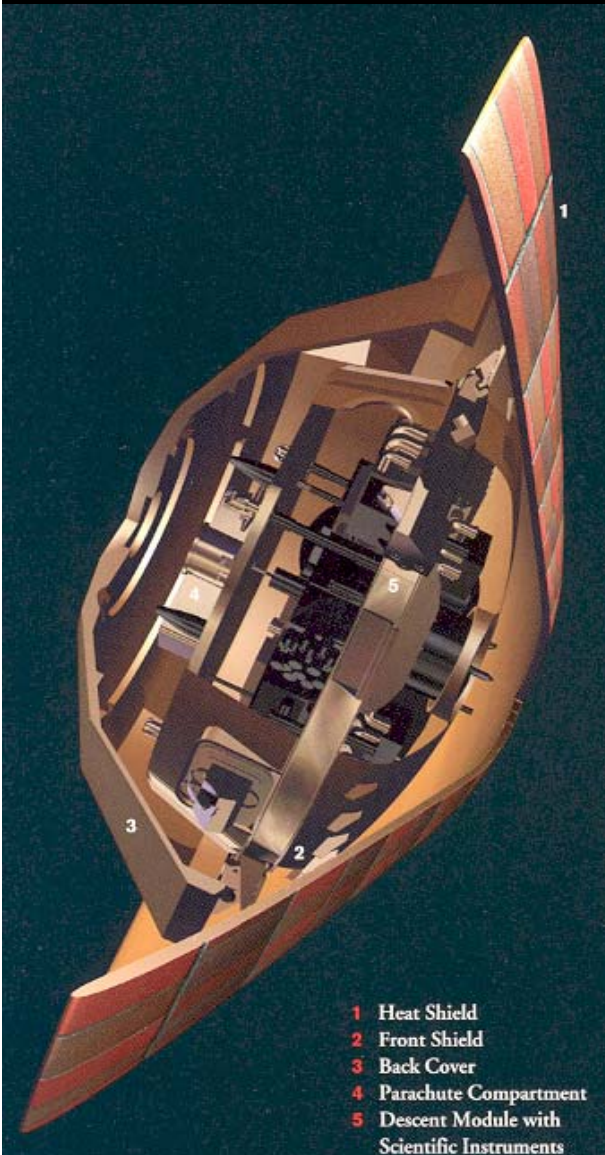


National Aeronautics and Space Administration

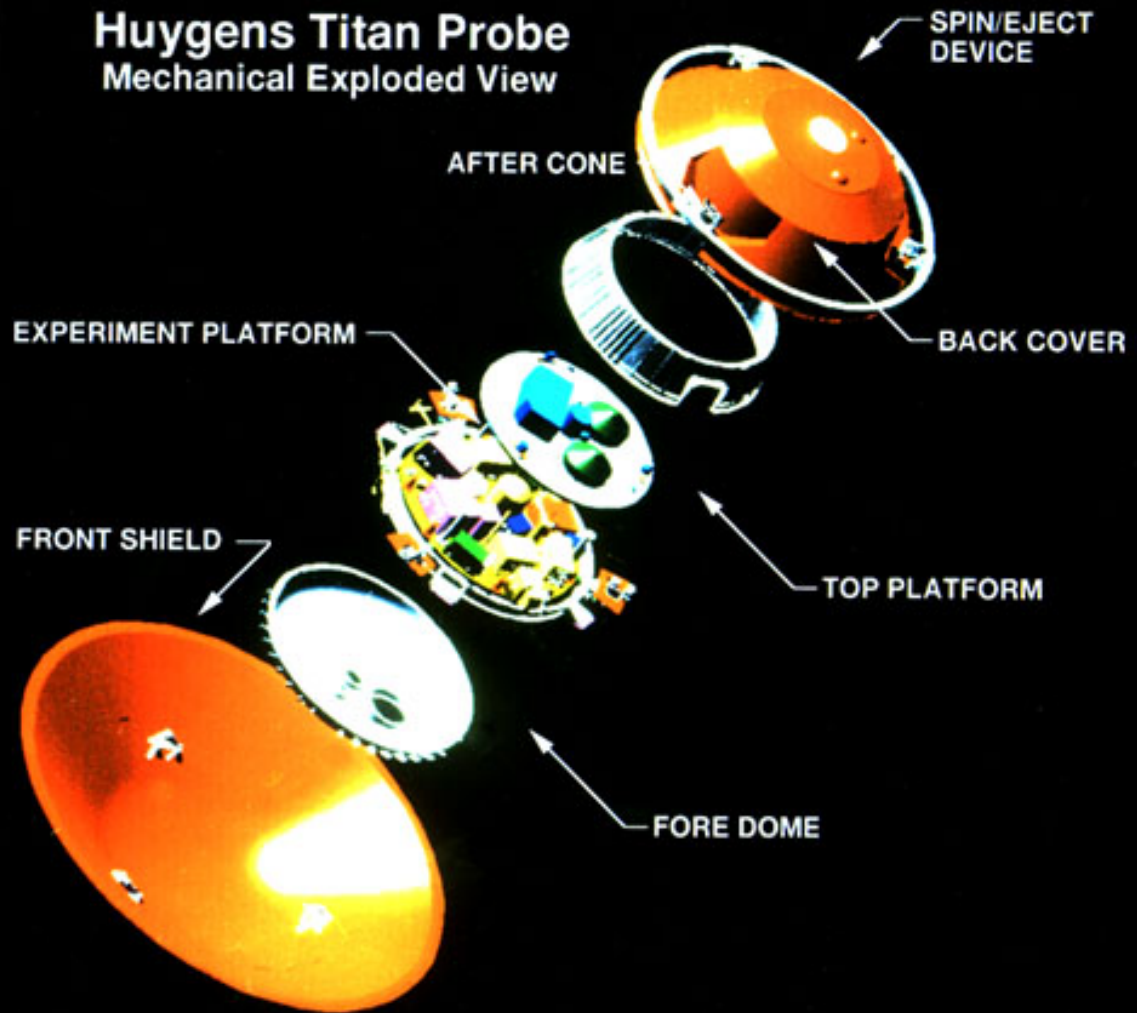
Huygens Probe @ the Pad

Cassini

Huygens Probe Exploded View



National Aeronautics and Space Administration



Cassini



National Aeronautics and Space Administration

Cassini Processing At the PHSF/ KSC

Cassini

Cassini processing in the ES at LC-40/CCAS

National Aeronautics and Space Administration



Cassini



TITAN IV B Launched CASSINI on 10-15-97 from CCAS

Cassini's VVEJGA Trajectory

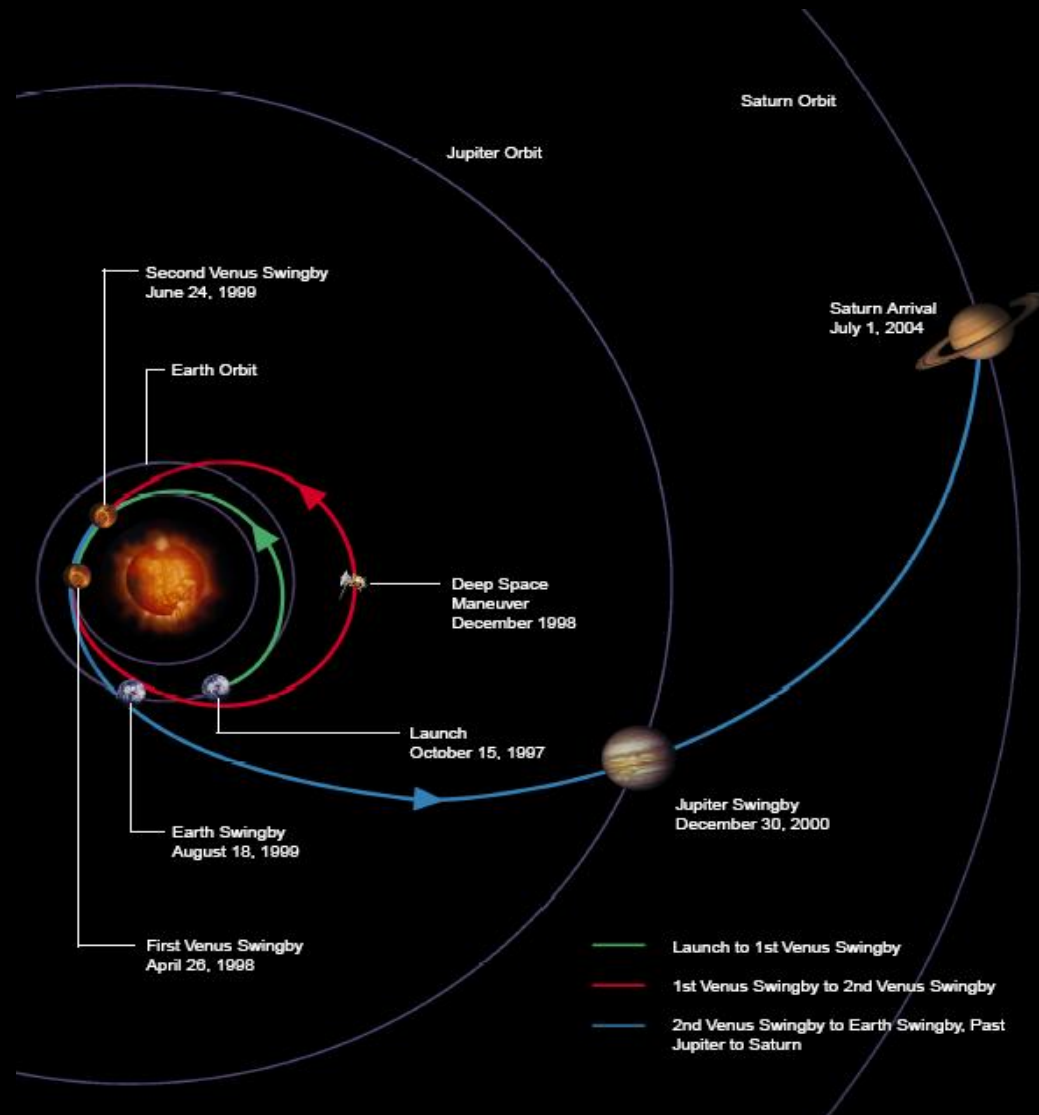
V:1998

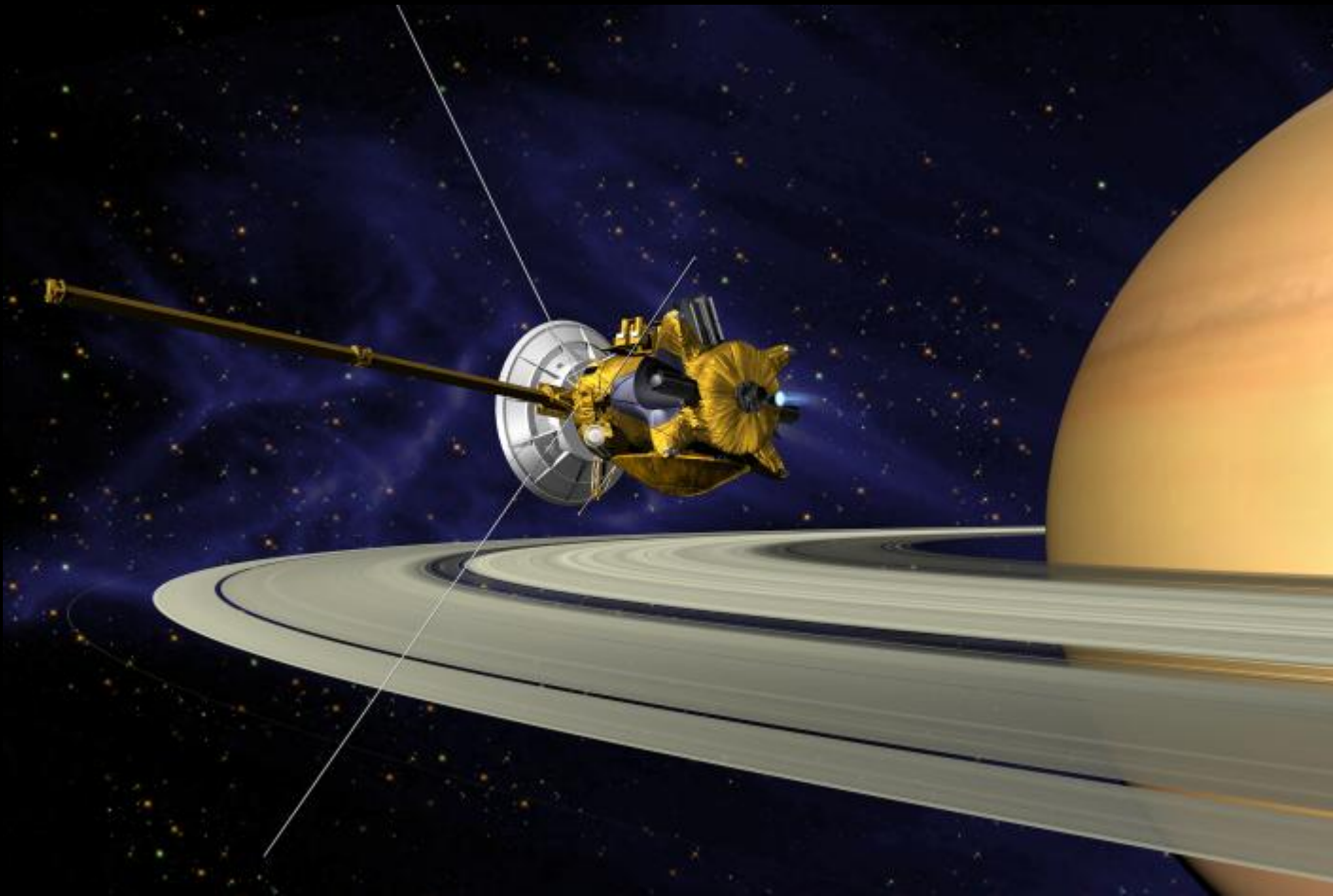
V:1999

E:1999

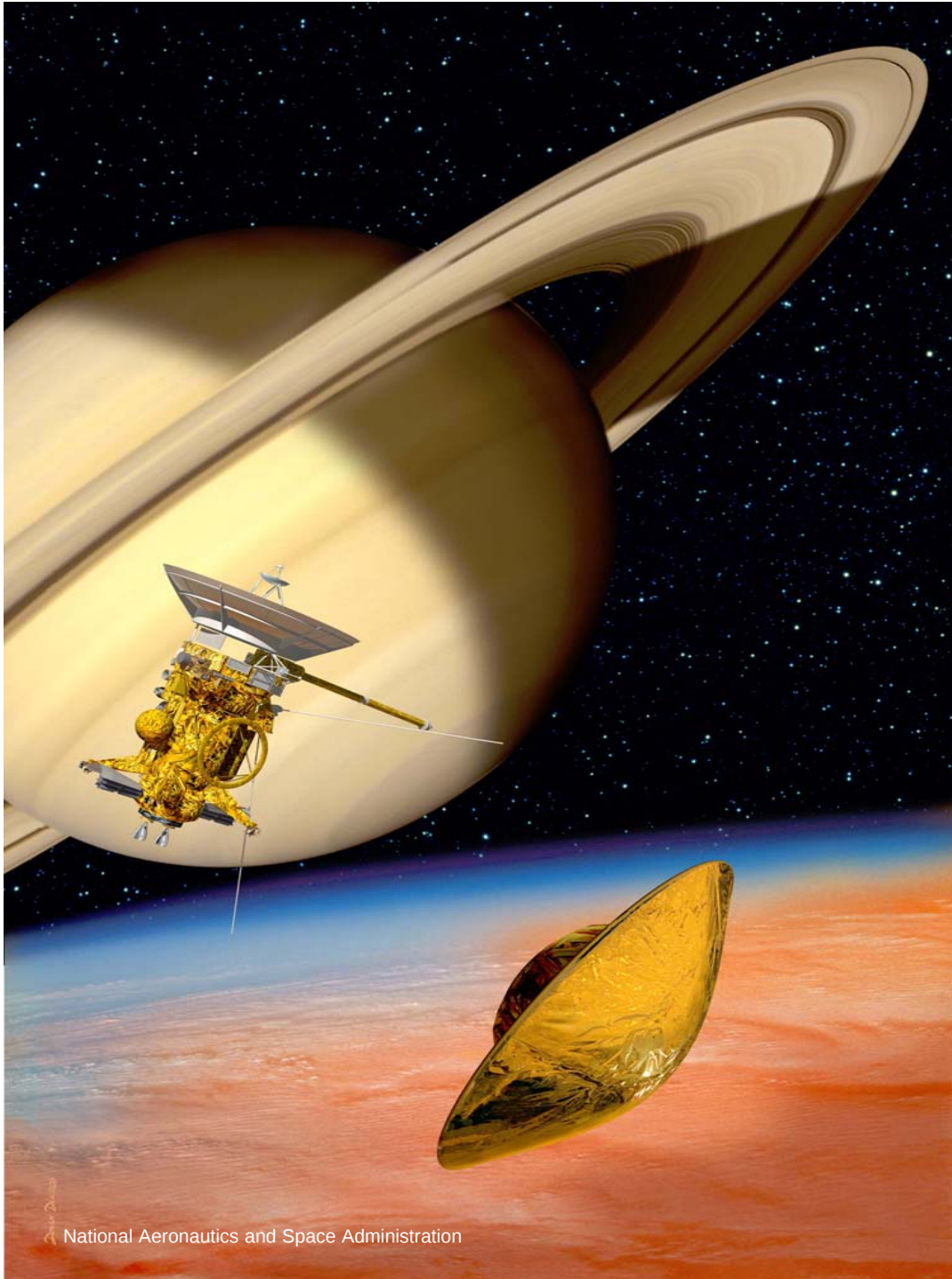
J:2000

S:2004





SOI maneuver (90 minutes long) allowed Cassini to be captured by Saturn's gravity into a 5-month orbit.



Huygens will be the first spacecraft to land on a world in the outer Solar System

22 day cruise toward Titan

**In January 15, 2005
Huygens landed on the
surface of Titan**

**The Huygens data may
offer clues about how
life began on Earth.**

One of the Landing Scenarios



Cassini Orbiter Instruments

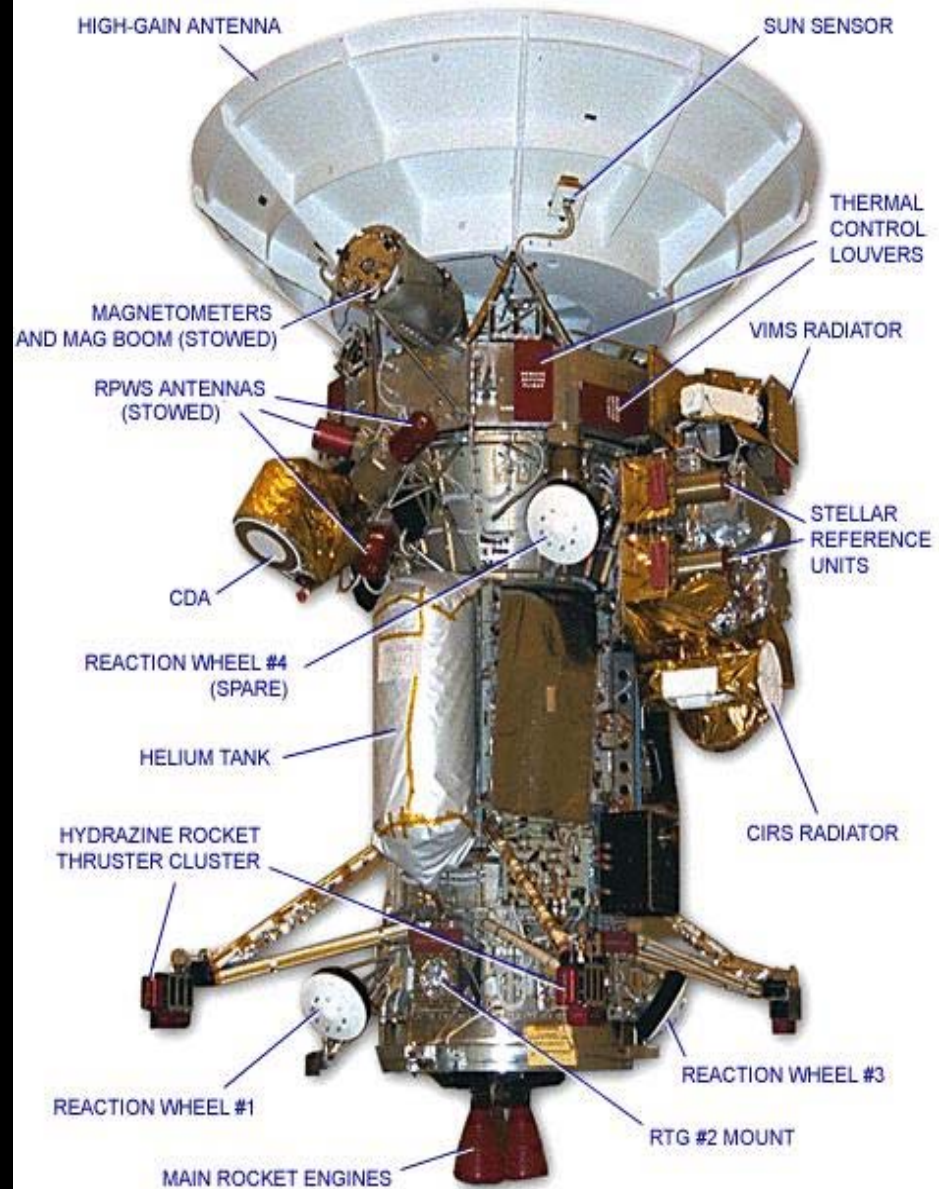
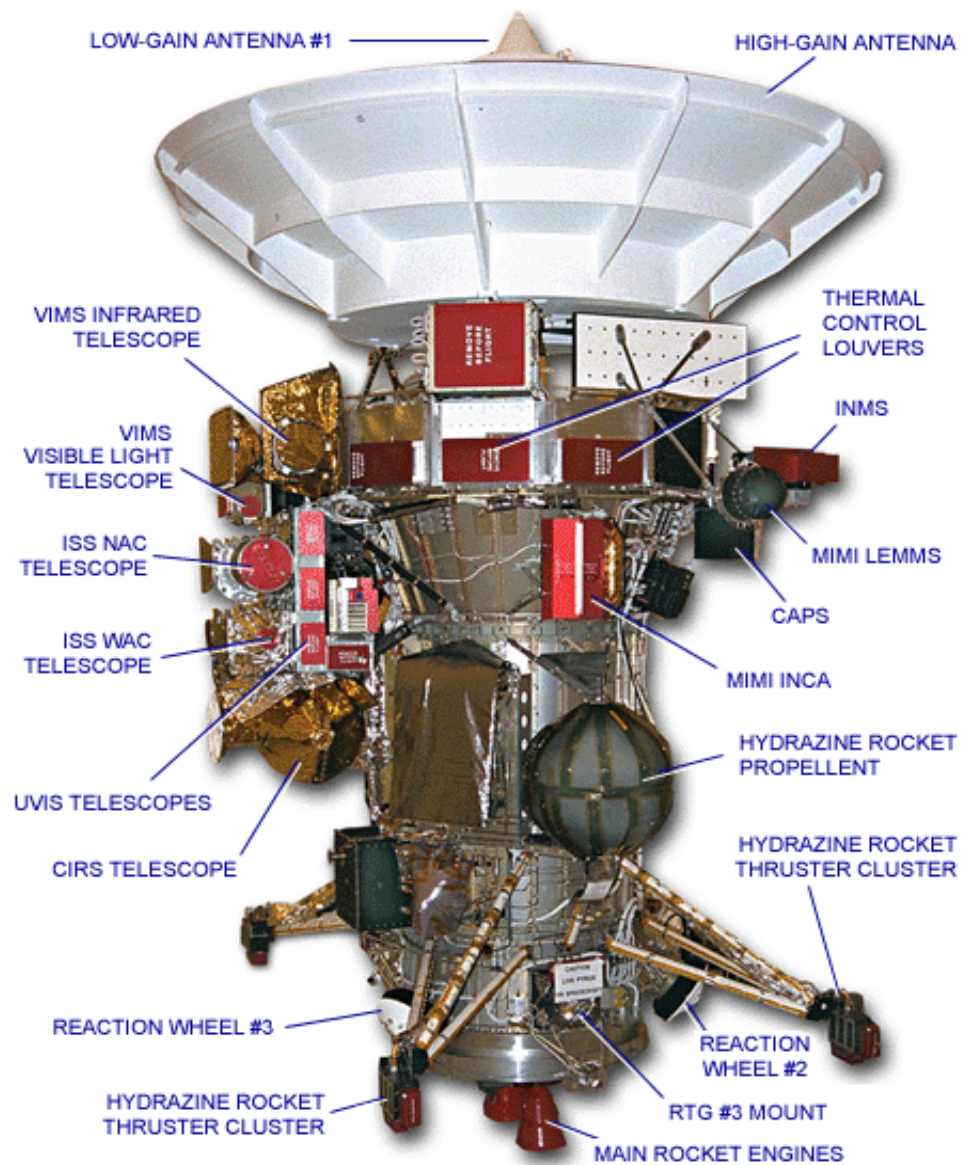
12 Instruments that Survey, sniff, analyze, scrutinize and take stunning images in various visible spectra.

Optical Remote Sensing

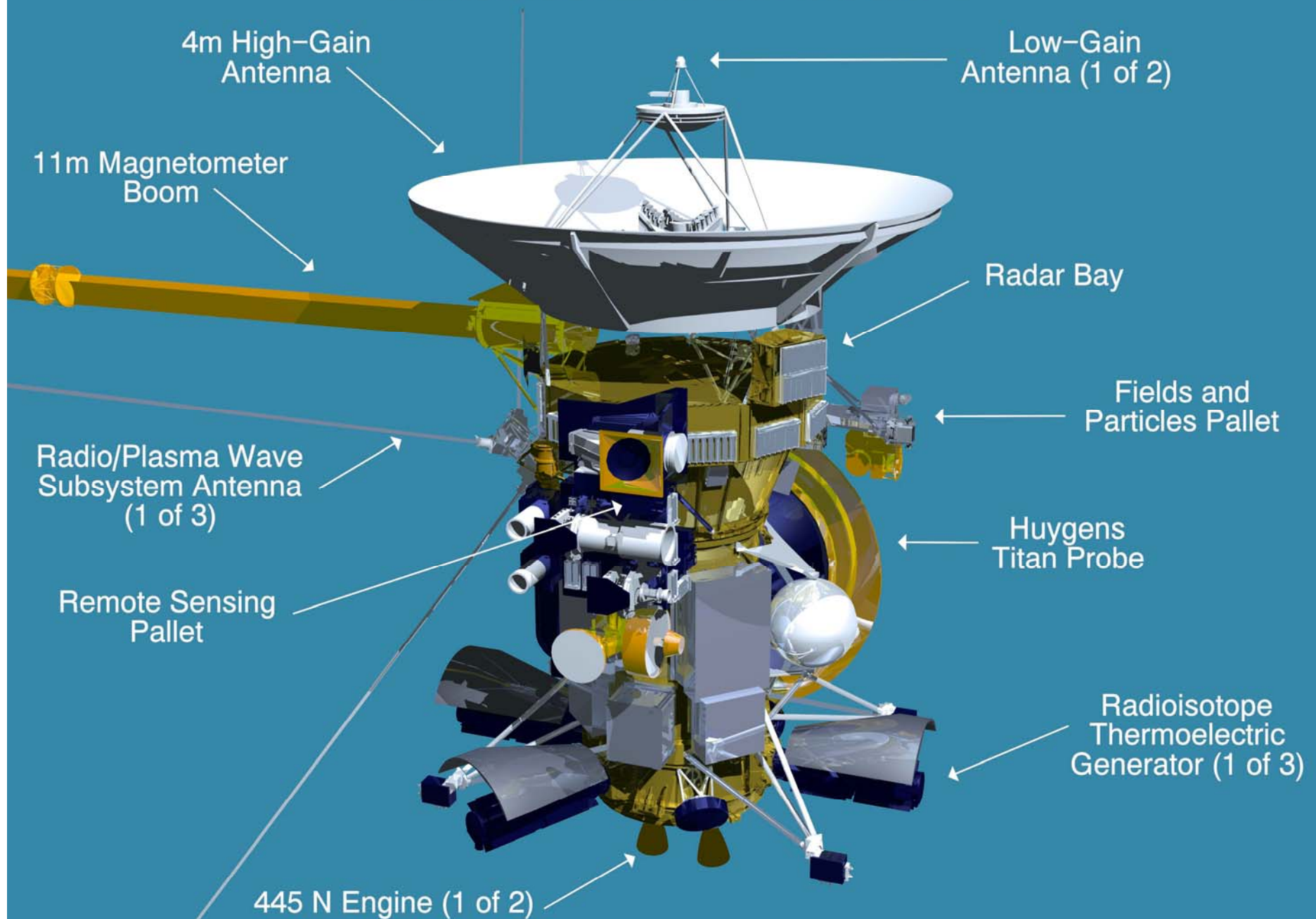
Mounted on the remote sensing pallet, these instruments study Saturn and its rings and moons in the electromagnetic spectrum.

- 1.Composite Infrared Spectrometer (CIRS)**
- 2.Imaging Science Subsystem (ISS)**
- 3.Ultraviolet Imaging Spectrograph (UVIS)**
- 4.Visible and Infrared Mapping Spectrometer (VIMS)**

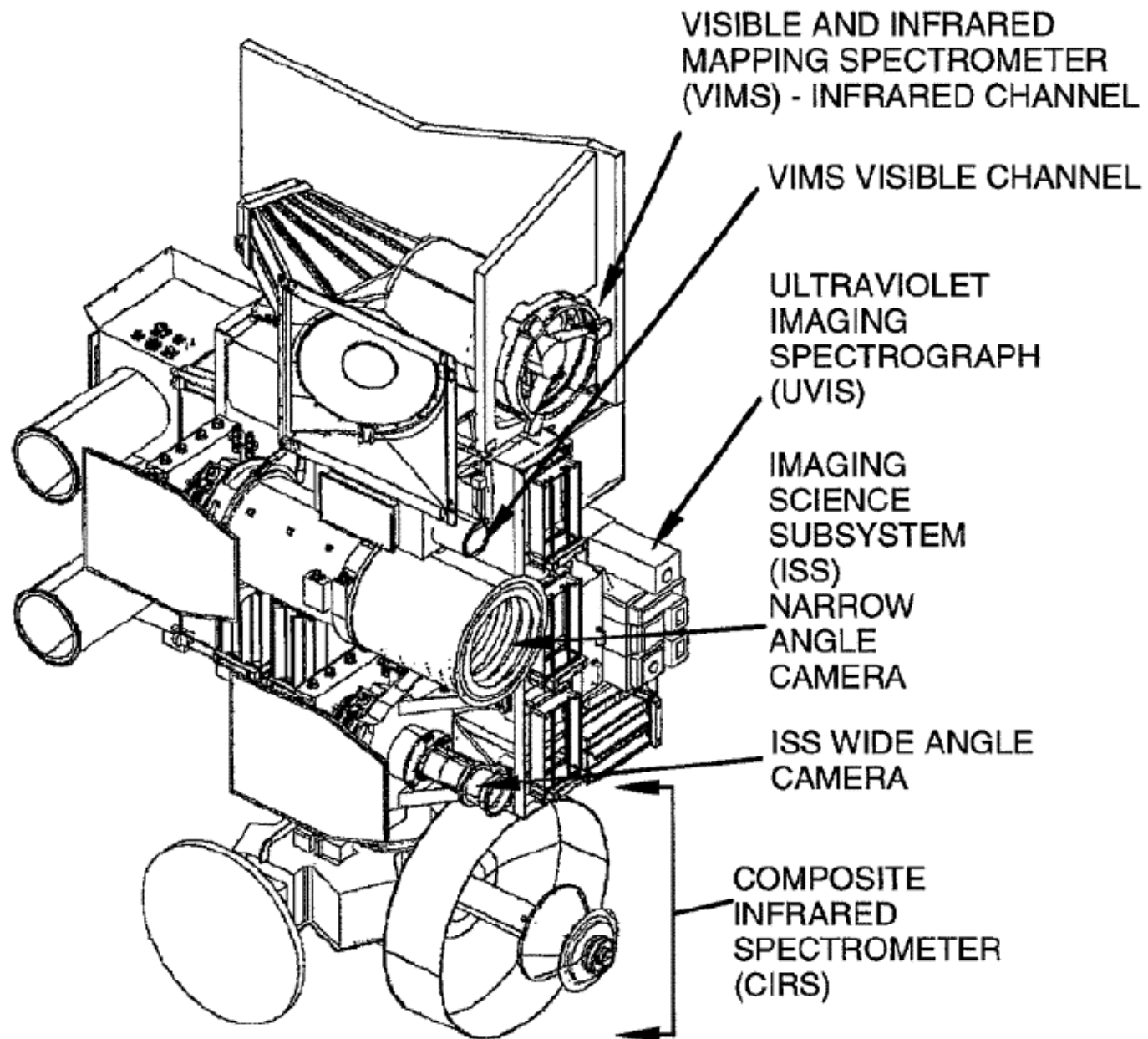
Cassini Spacecraft



CASSINI SPACECRAFT



REMOTE SENSING PALLET



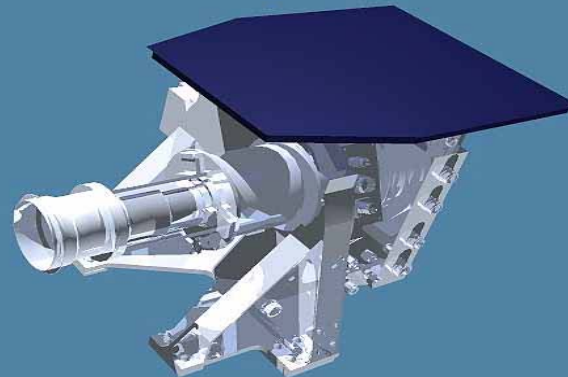
Cassini's Most Important instrument



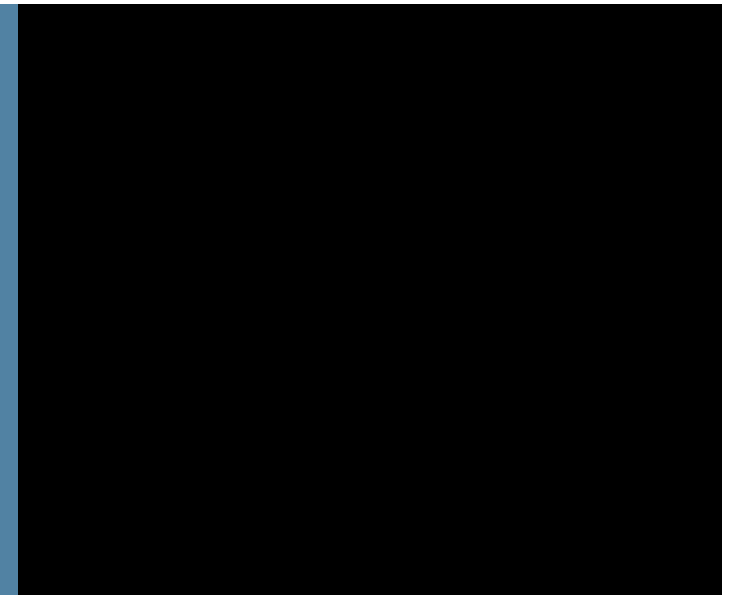
ISS NAC
Imaging Science Subsystem
Narrow Angle Camera



ISS WAC
Imaging Science Subsystem
Wide Angle Camera



**Space Science
Institute**



VIMS

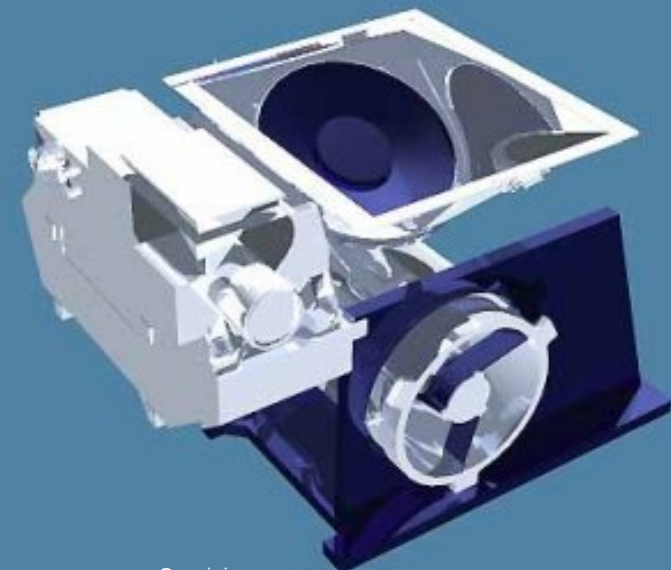
Visible and Infrared Mapping System

Creates maps of the color properties of the atmosphere of Saturn & Titan, the surfaces of the moons and the rings to study their composition and structure

**Search for volatiles: Water Ice, CO₂
Search for minerals and organics**

University of Arizona

National Aeronautics and Space Administration



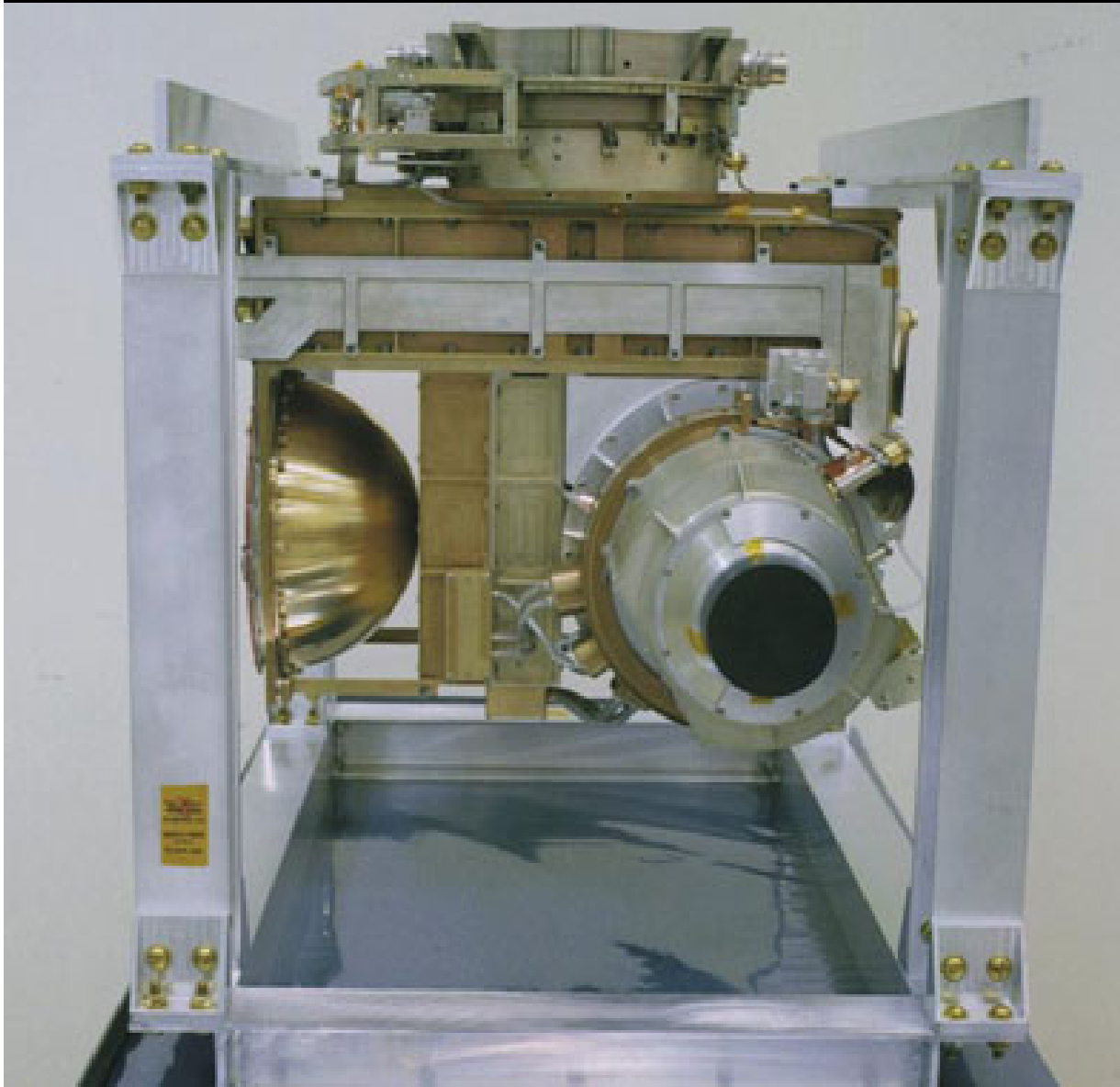
Cassini

Fields, particles and Waves

Study the dust, plasma and magnetic field around Saturn.

While most don't produce pictures the information they collect is critical to scientists Understanding of this rich environment

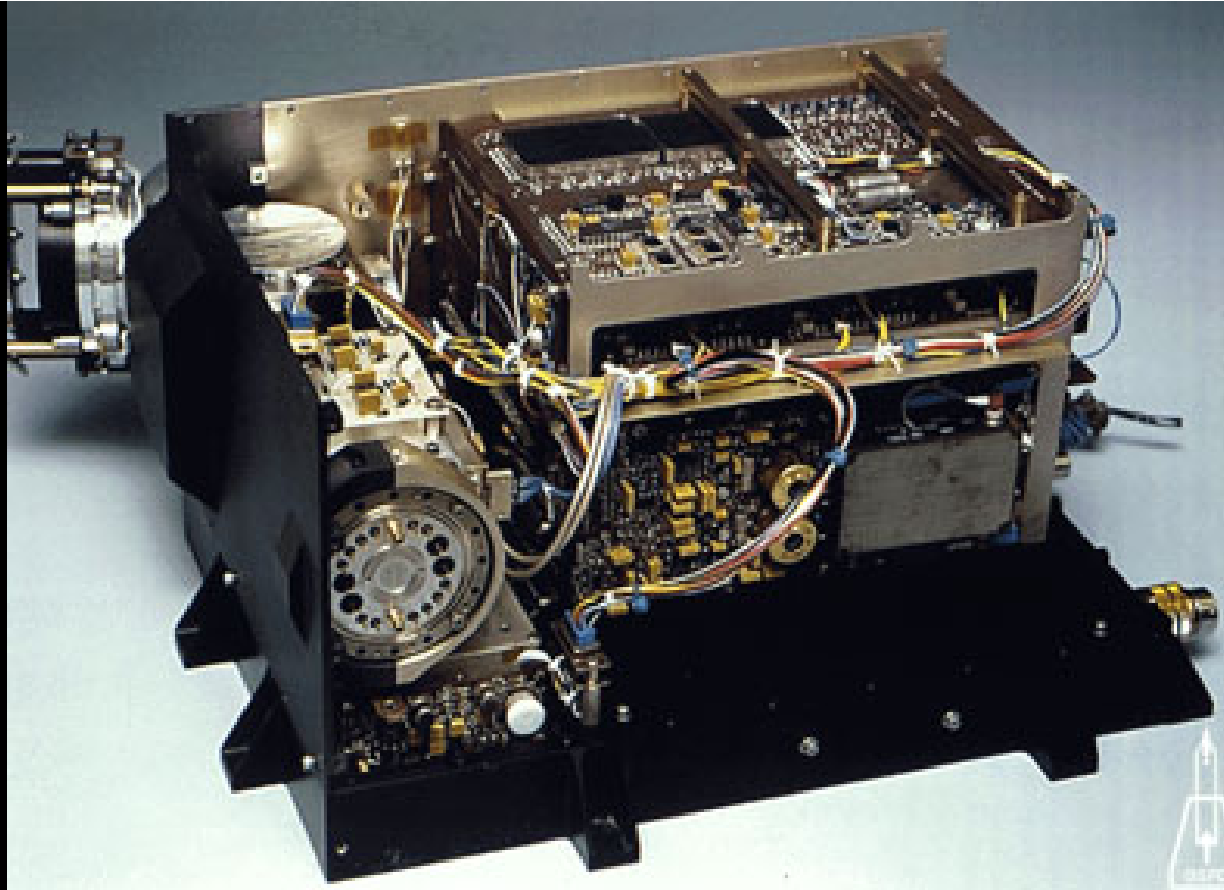
- 1.Cassini Plasma Spectrometer (CAPS)**
- 2.Cosmic Dust Analyzer (CDA)**
- 3.Ion and Neutral Mass Spectrometer (INMS)**
- 4.Magnetometer (MAG)**
- 5.Magnetospheric Imaging Instrument (MIMI)**
- 6.Radio and Plasma Wave Science (RPWS)**



CAPS Cassini Plasma Spectrometer

**Scoops up plasma
and measure its
composition,
density, speed, and
temp. throughout
Saturn 3 dimensional
magnetic field.**

**Southwest Research
Institute**



INMS (Ion and neutral Mass Spectrometer)

**Can detect neutral atoms and positively charged ions.
Scoops up material and determines the compositions and isotopic abundances
of chemical and elements in the upper reaches of Saturn and Titan's
atmosphere and Saturn E ring
Southwest Research Institute**

Cosmic Dust Analyzer (CDA)

Max Planck Institut für
Kernphysik

Microwave Remote Sensing

Using Radio waves these instruments map atmospheres, determine the mass of moons, Collect data on ring particle size, and unveil the surface of Titan

1.Radar

2.Radar Science (RSS)

Huygens Instruments

Aerosol Collector and Pyrolyser (ACP)

Collect aerosols for chemical-composition analysis

Descent Imager / Spectral Radiometer (DISR)

Images and spectra of the surface material

Doppler Wind Experiment (DWE)

Uses Radio signals to deduce atmospheric properties

Gas Chromatograph and Mass Spectrometer (GCMS)

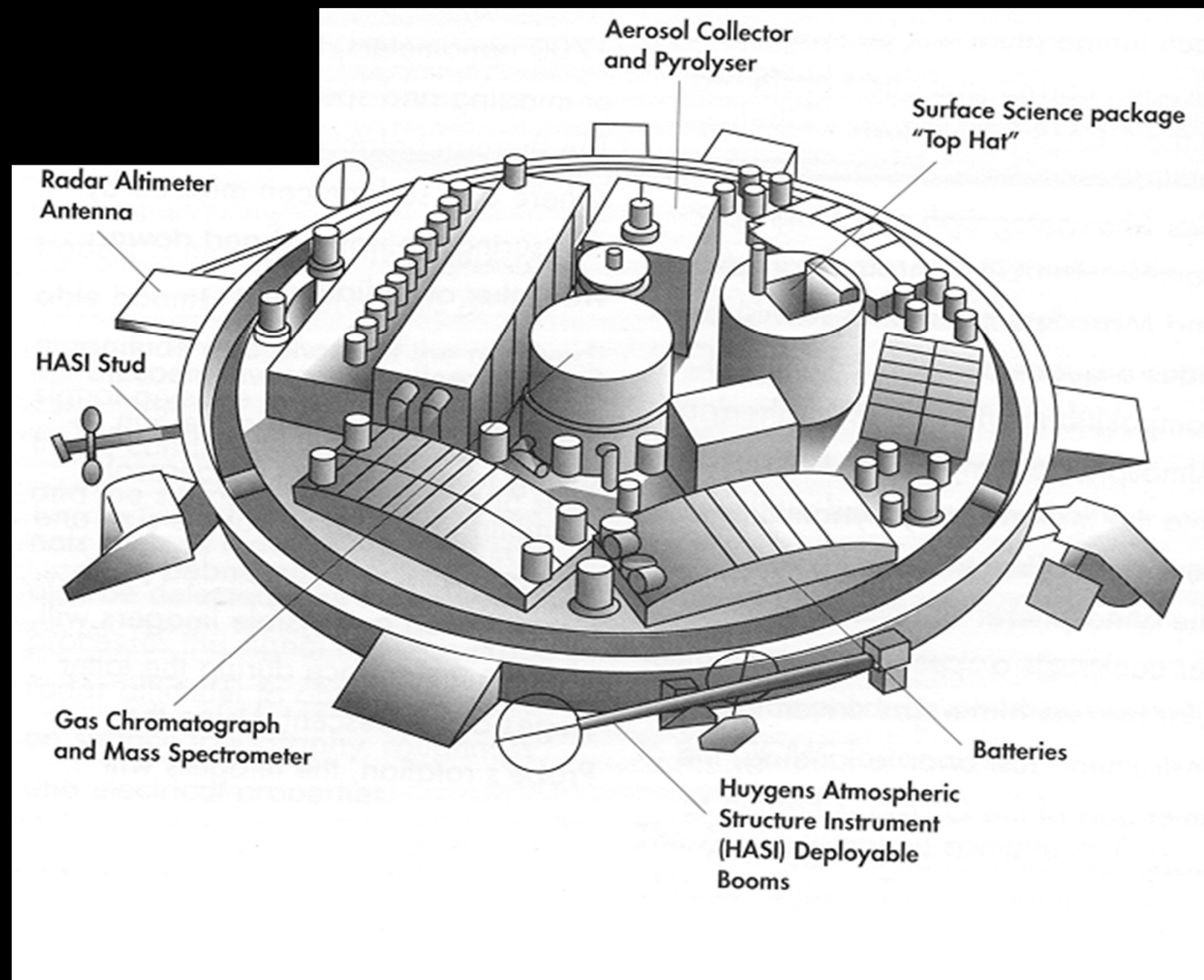
Chemical analyzer designed to identify and quantify various atmospheric constituents

Huygens Atmospheric Structure Instrument (HASI)

Comprises sensors for measuring the physical and electrical properties of the atmosphere and an on board microphone to send back sounds from Titan

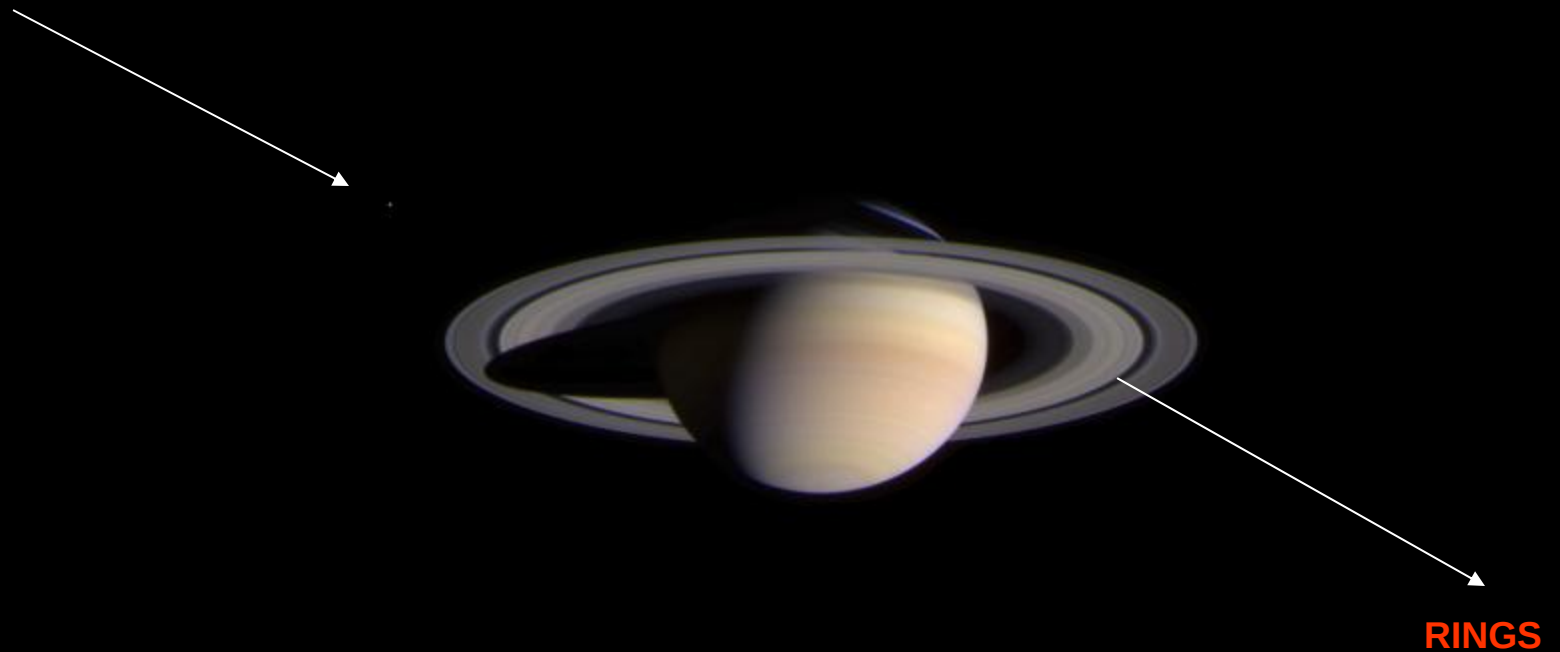
Surface Science Package (SSP)

Suites of sensors to determine the physical properties at the surface at the impact site



FINDINGS FROM CASSINI & HUYGENS

Approach to Saturn Feb 9, 2004





Titan's First Close-Up October 26, 2004

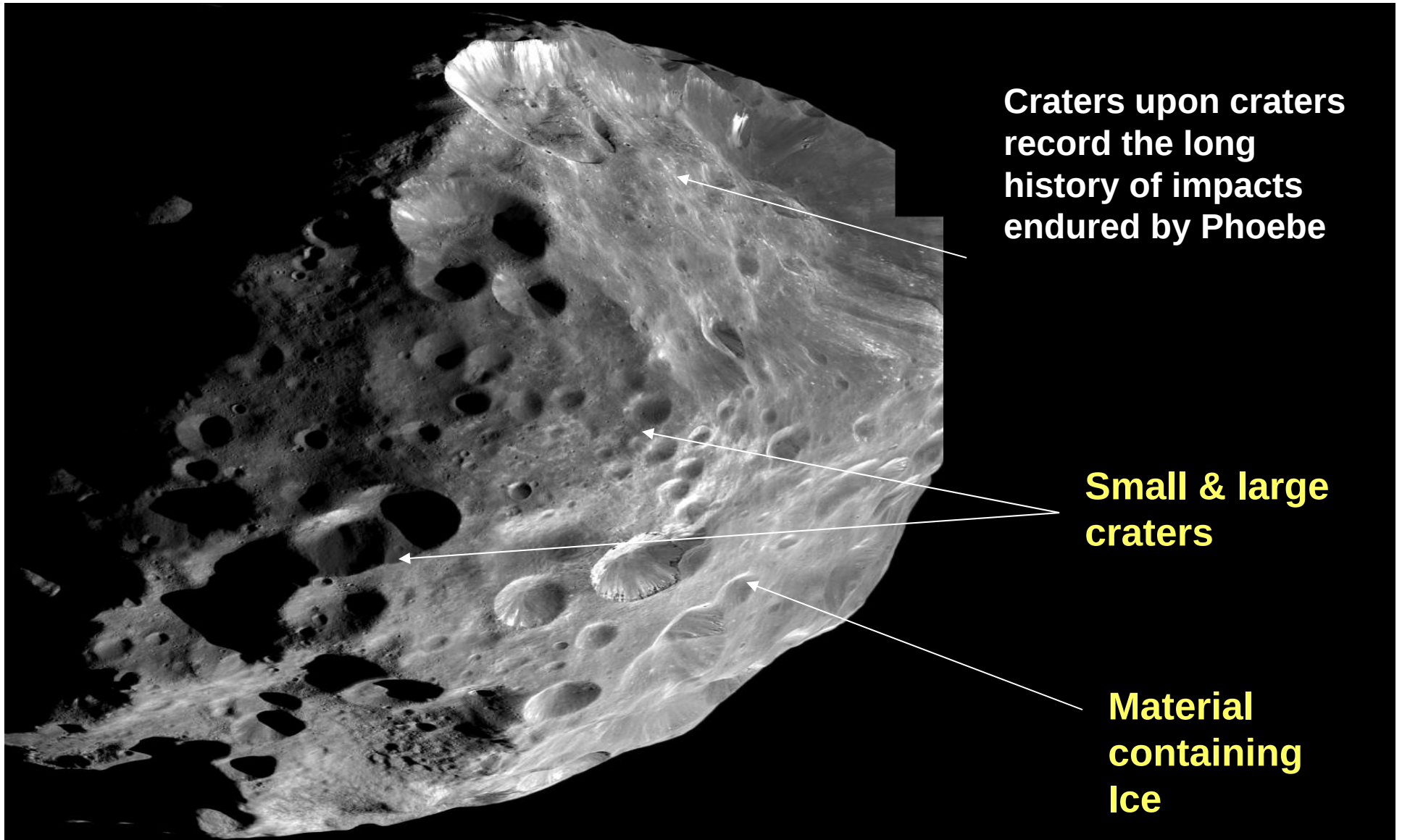
This image is one of the closest ever taken of Saturn's hazy moon Titan. It was captured by Cassini's imaging science subsystem on Oct. 26, 2004, as the spacecraft flew by Titan. At its closest, Cassini was 1,200 kilometers (745 miles) above the moon, 300 times closer than during its first flyby on July 3, 2004.

Two pairs of Storms

June 4, 2004

Storms

Cassini narrow angle detected



Craters upon craters
record the long
history of impacts
endured by Phoebe

**Small & large
craters**

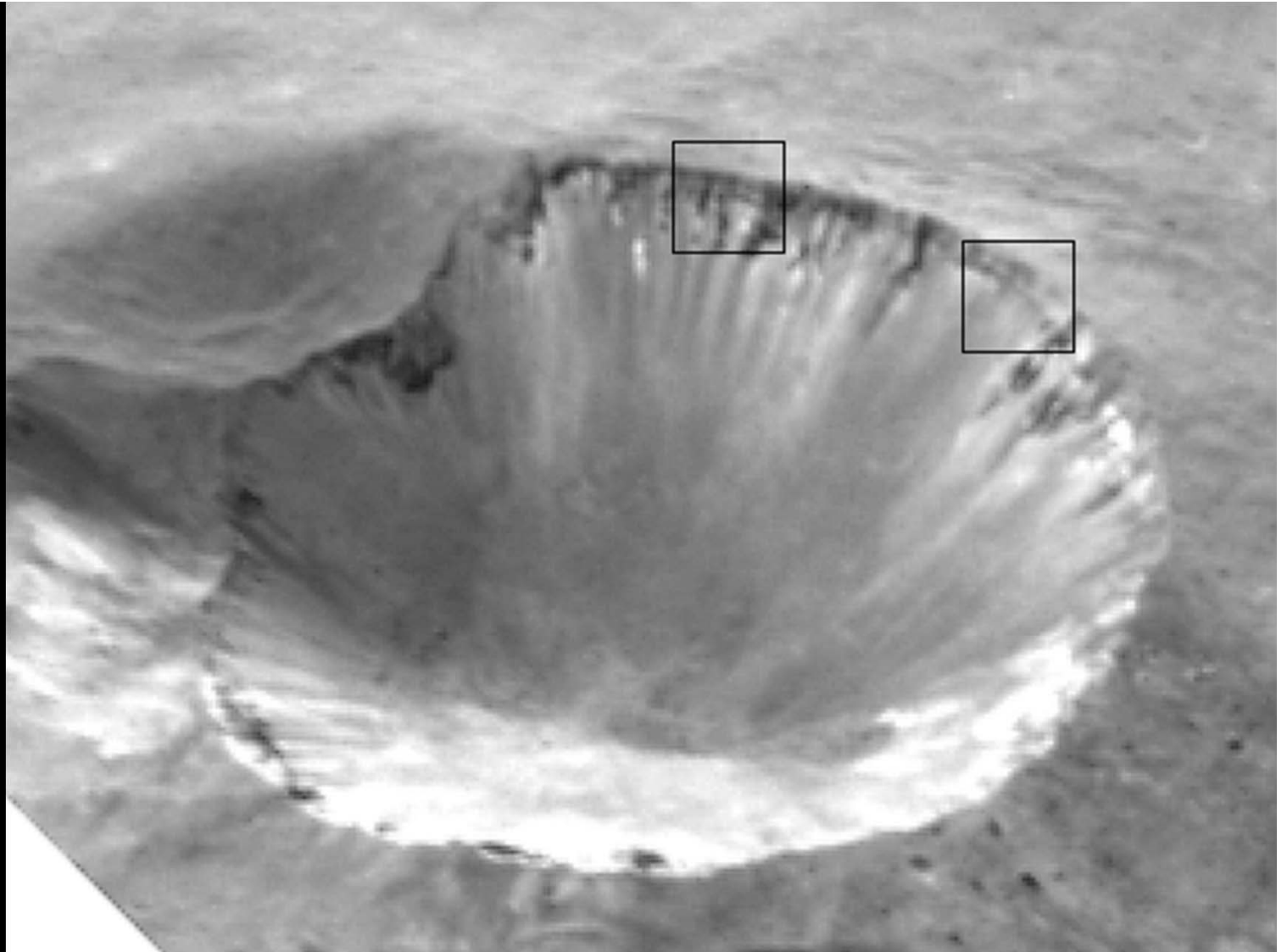
**Material
containing
Ice**

PHOEBE – High Resolution/1000x better than Voyager

National Aeronautics and Space Administration

Cassini

**Large Crater
on Phoebe**

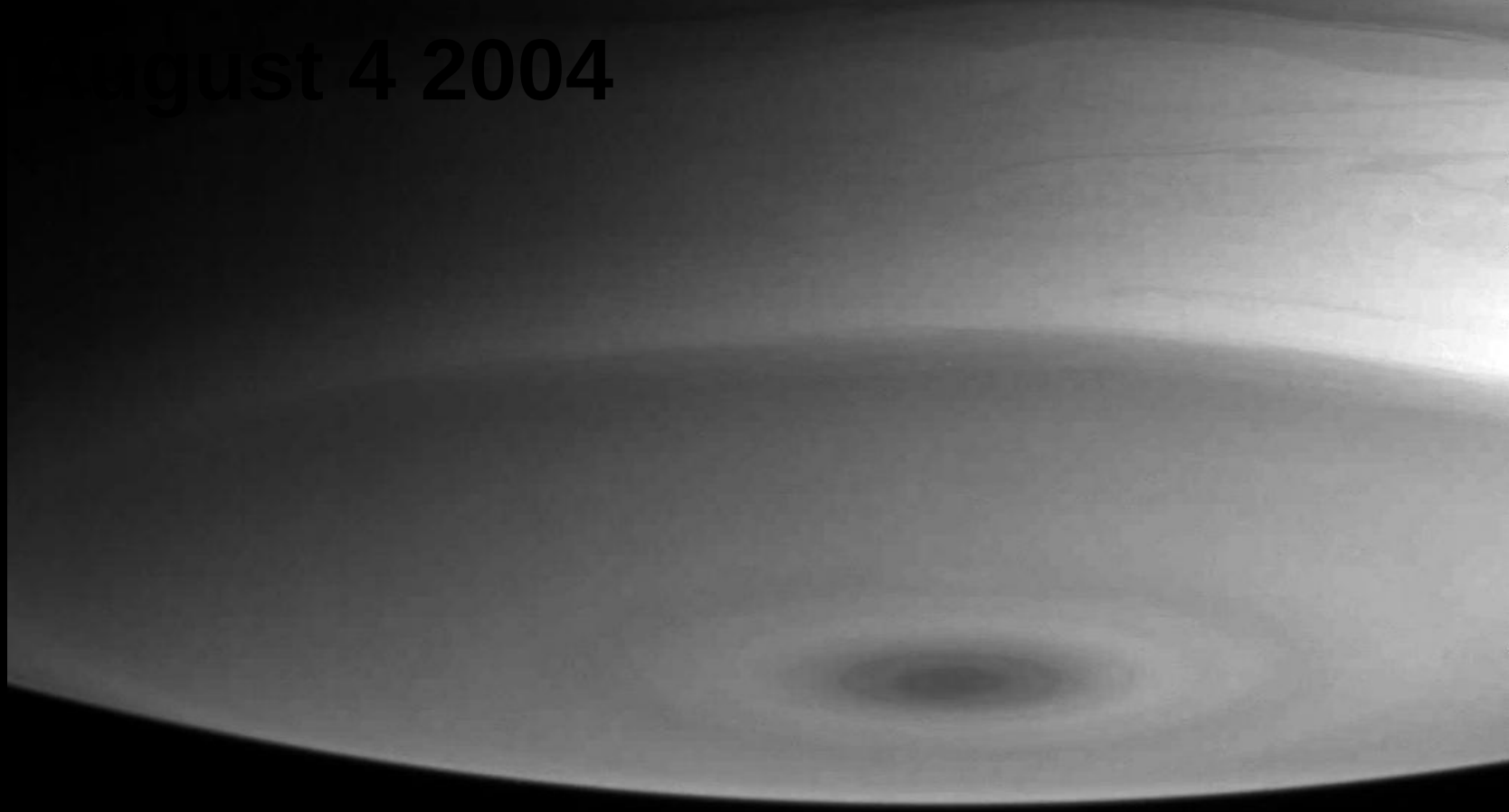


Crater Close-up on Phoebe

June 13, 2004

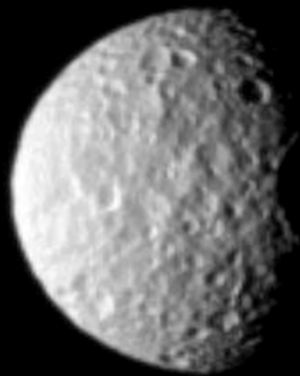
Saturn Polar Structure

August 4 2004

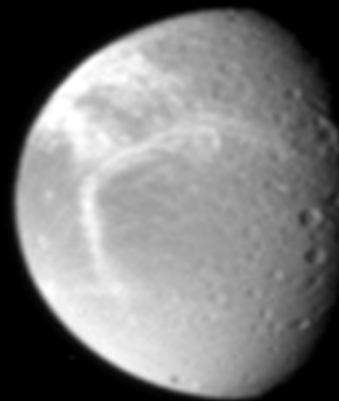


Saturn's southern polar region exhibits concentric rings of clouds which encircle a dark spot at the pole. To the north and toward the right, wavy patterns are evident, resulting from the atmosphere moving with different speeds at different latitudes.

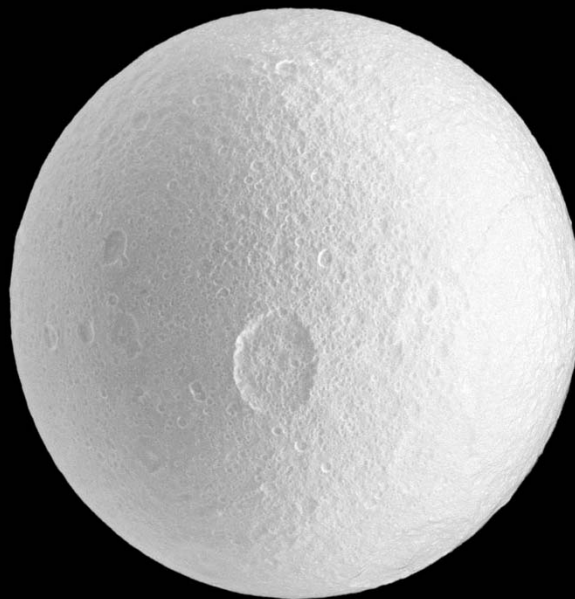
The image was taken with the Cassini spacecraft narrow angle camera from a distance of 5 million kilometers (3.1 million miles) from Saturn,.



**Cratered
surface of
Mimas**



**Bright fractures in
the icy crust of
Dione**



large Penelope crater on Saturn's moon Tethys.



The surface is stained by roughly north-south trending wispy streaks of dark material.

The absence of an atmosphere on Iapetus means that the material was deposited by some means other than precipitation, such as ballistic emplacement of material from elsewhere on the moon, or deposition of infalling material from elsewhere in the Saturn system.

Images taken in infrared, green, and ultraviolet light filters were combined to create this image. The view was obtained from a distance of about 172,900 kilometers (107,435 miles) from Iapetus.

Dark-stained Iapetus in unrivaled clarity
December 31, 2004



Lightning Strikes on Saturn

Giant oval in the ringed planet's southern hemisphere that is somewhat smaller than, but resembles in appearance, Jupiter's long-lived Great Red Spot.

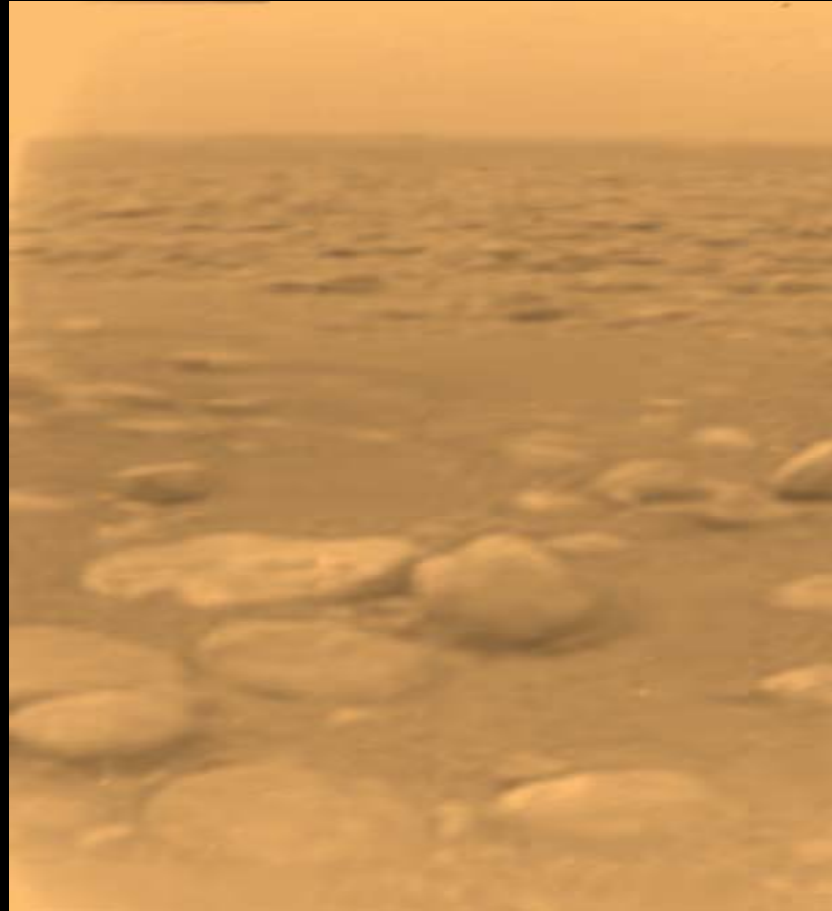


Dark belt

bright zones

boundary turbulence due to wind shear and density differences between adjacent bands

1st Picture of Titan



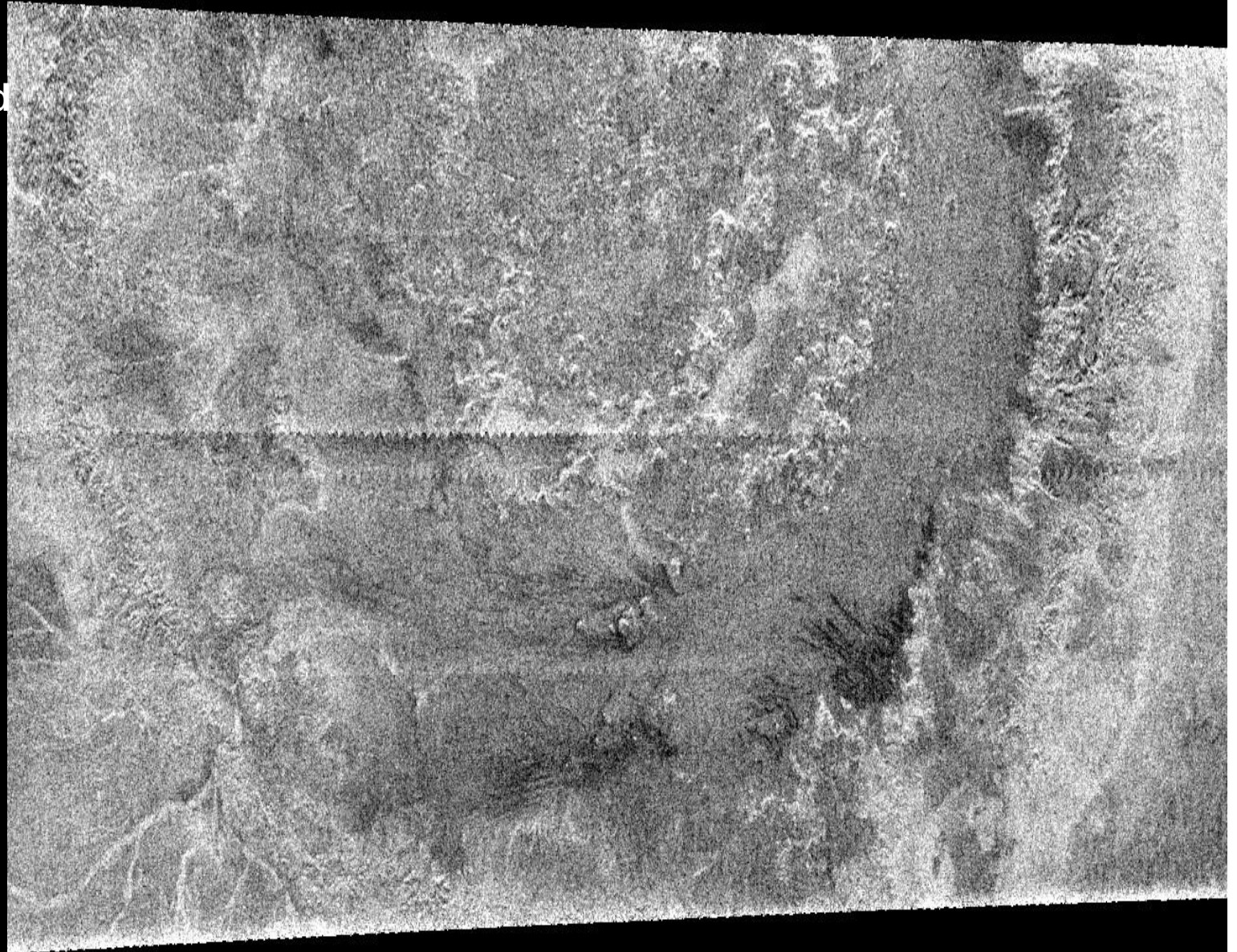
One of the first images taken by Huygens. Titan's surface is darker than scientists expected and is likely a mixture of water ice and hydrocarbons.

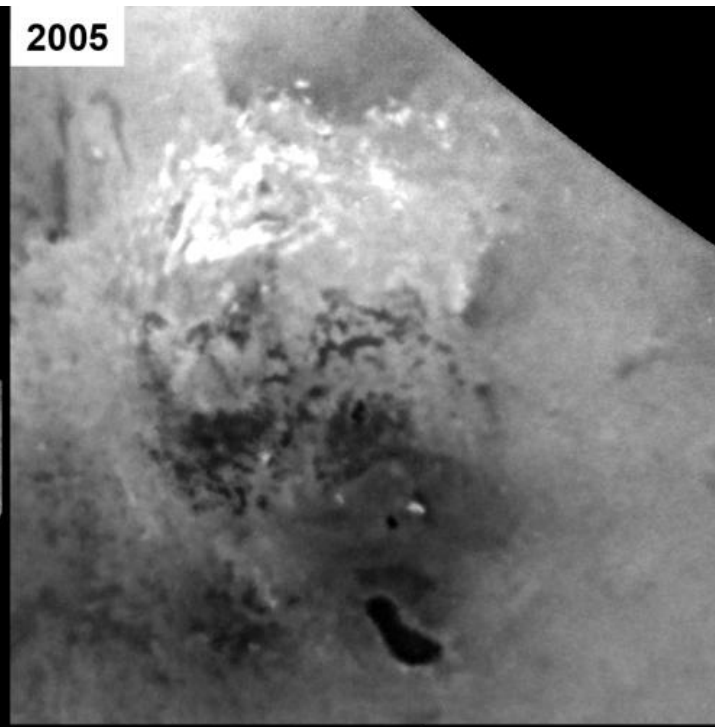
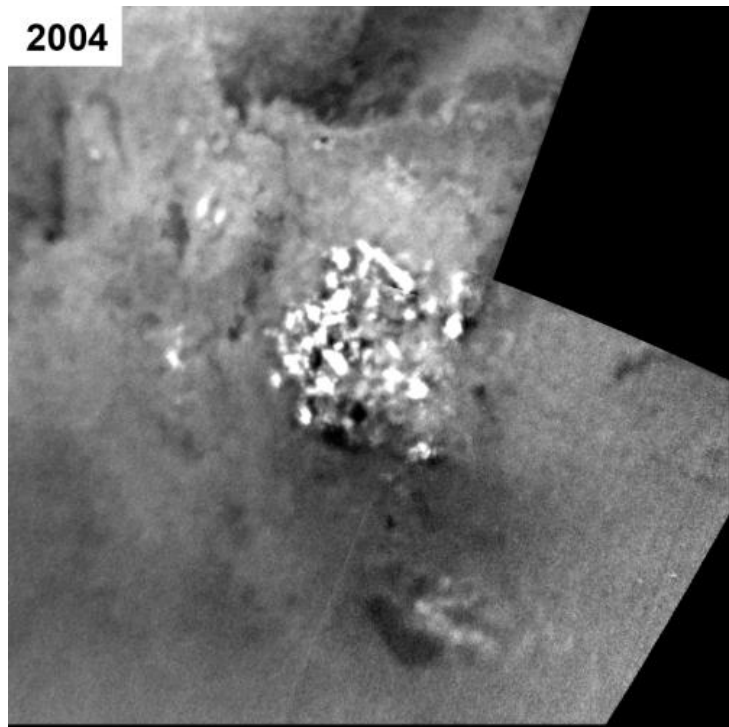
Circus Maximus- February 16, 2005

first impact
feature identified
in radar images
of Titan.

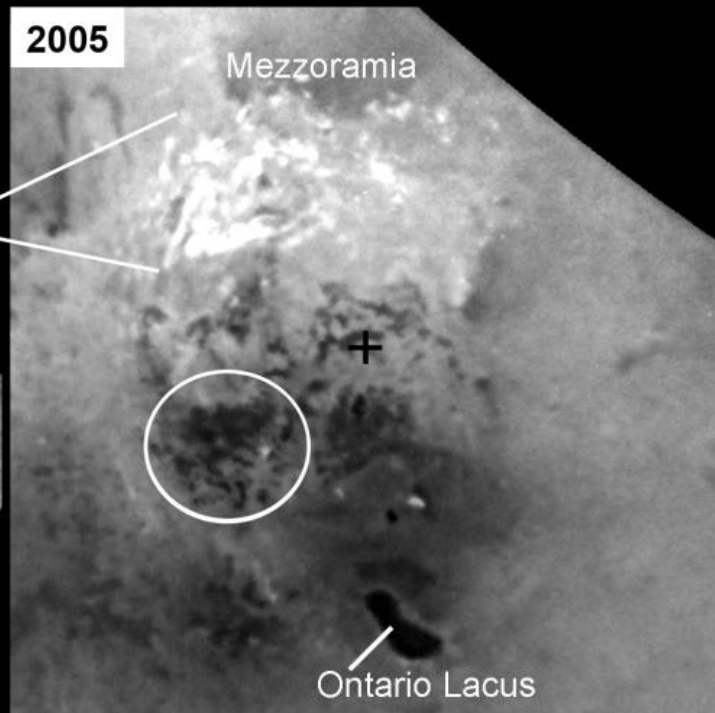
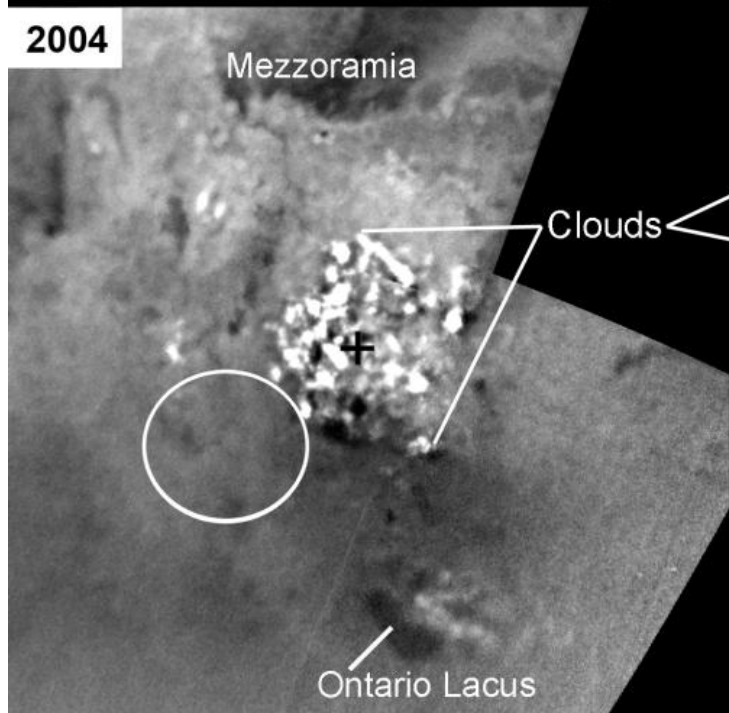
huge annular
feature with an
outer diameter
of ~ 440
kilometers (273
miles).

Resembles a
large crater or
part of a ringed
basin, either of
which could be
formed when a
comet or
asteroid tens of
kilometers in
size slammed
into Titan.





These mosaics of the south pole of Saturn's moon Titan, made from images taken almost one year apart, show changes in dark areas that may be lakes filled by seasonal rains of liquid hydrocarbons.



In the 2005 images, new dark areas are visible and have been circled in the labeled version. The very bright features are clouds in the lower atmosphere. Titan's clouds behave similarly to those on Earth, changing rapidly on timescales of hours and appearing in different places from day to day.

Mimas Blues

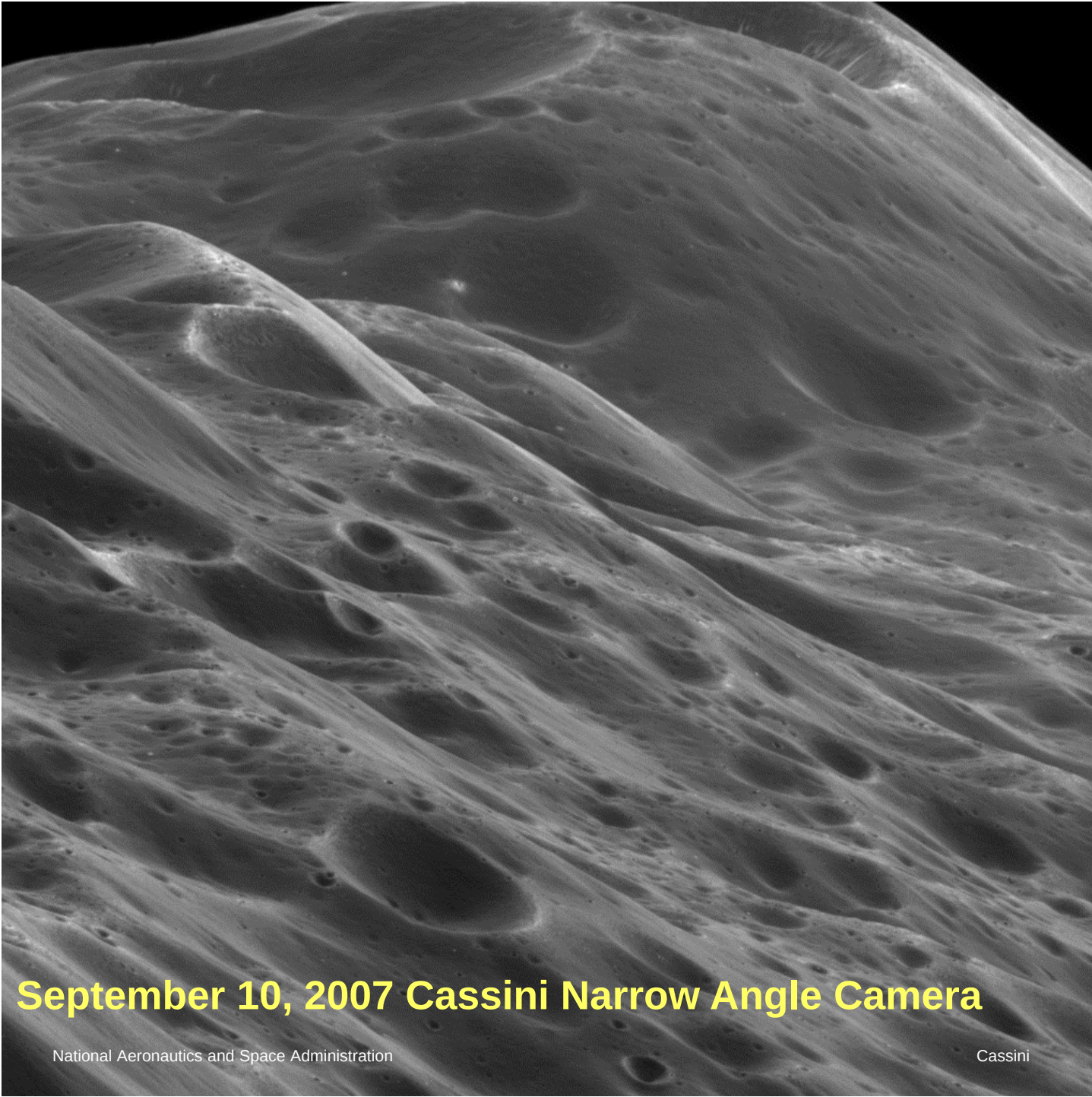
Mimas drifts along in its orbit against the azure backdrop of Saturn's northern latitudes in this true color view.

Images taken using infrared (930 nanometers), green (568 nanometers) and ultraviolet (338 nanometers) spectral filters were combined. The colors have been adjusted to match closely what the scene would look like in natural color.

The images were obtained using the Cassini spacecraft narrow angle camera on Jan. 18, 2005, at a distance of approximately 1.4 million kilometers (870,000 miles) from Saturn.



Jan 18, 2005



IAPETUS

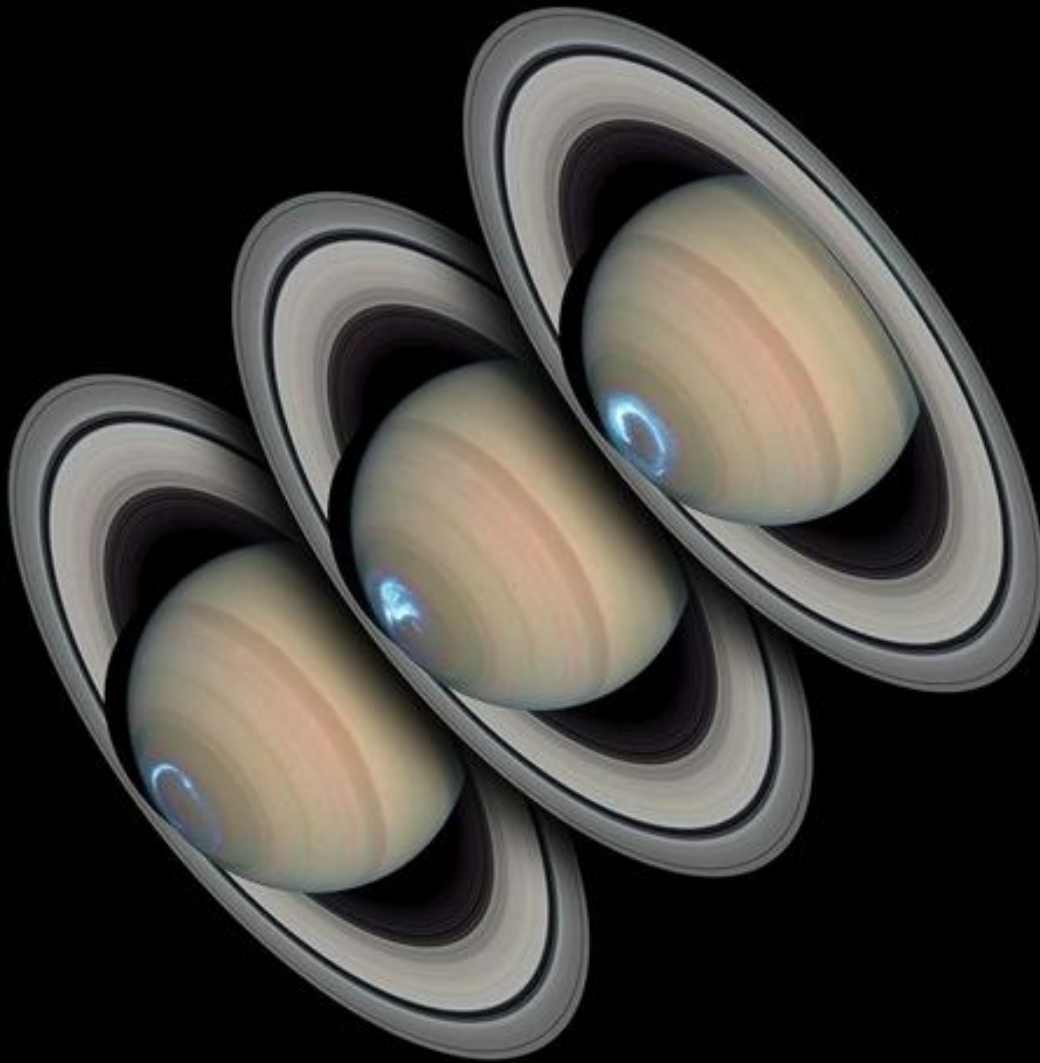
This stunning close-up shows mountainous terrain reaching about 10 km in height on Iapetus.

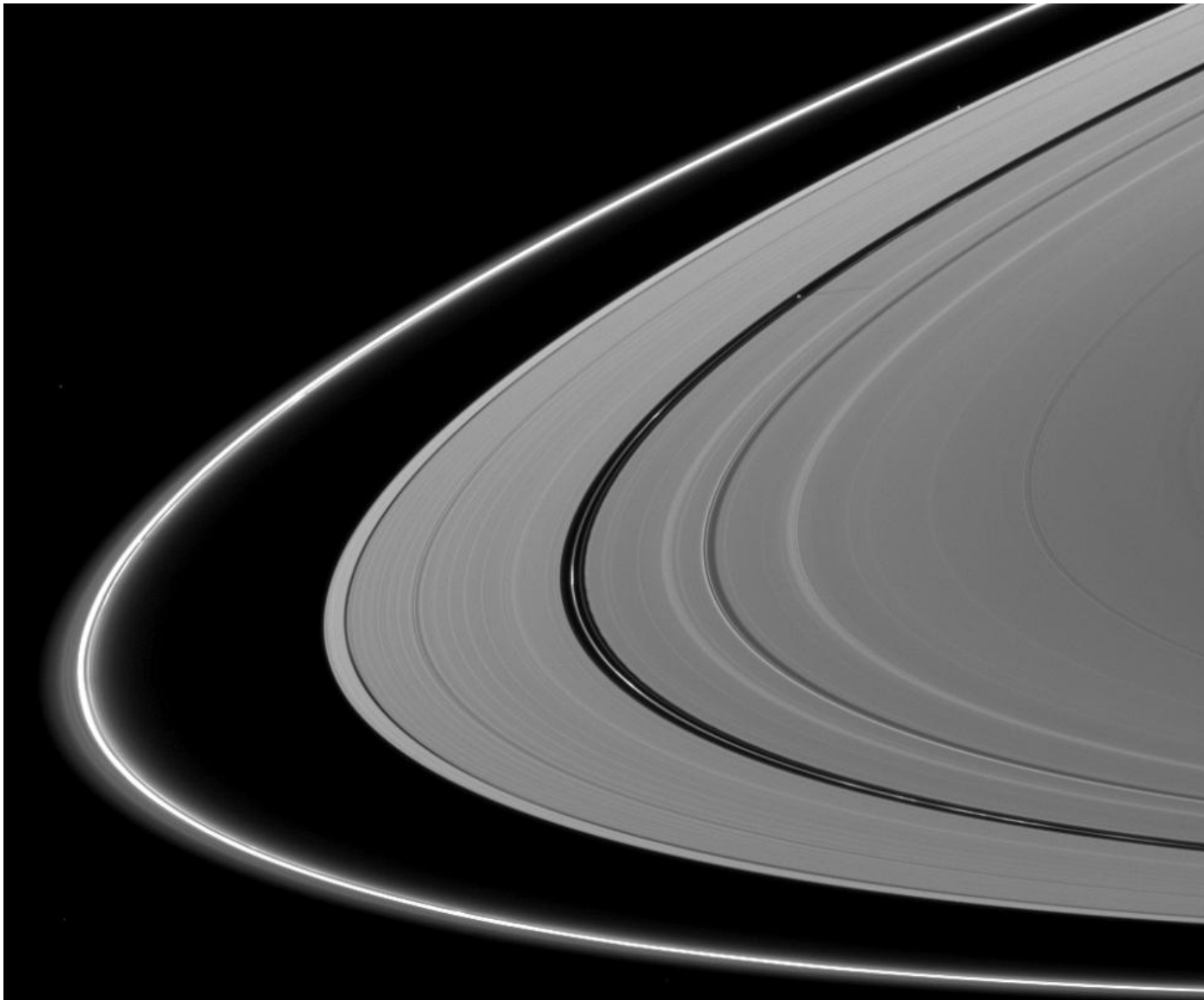
Above the middle of the image can be seen a place where an impact has exposed the bright ice beneath the dark overlying material

September 10, 2007 Cassini Narrow Angle Camera

Saturn's Auroras

February 16, 2005

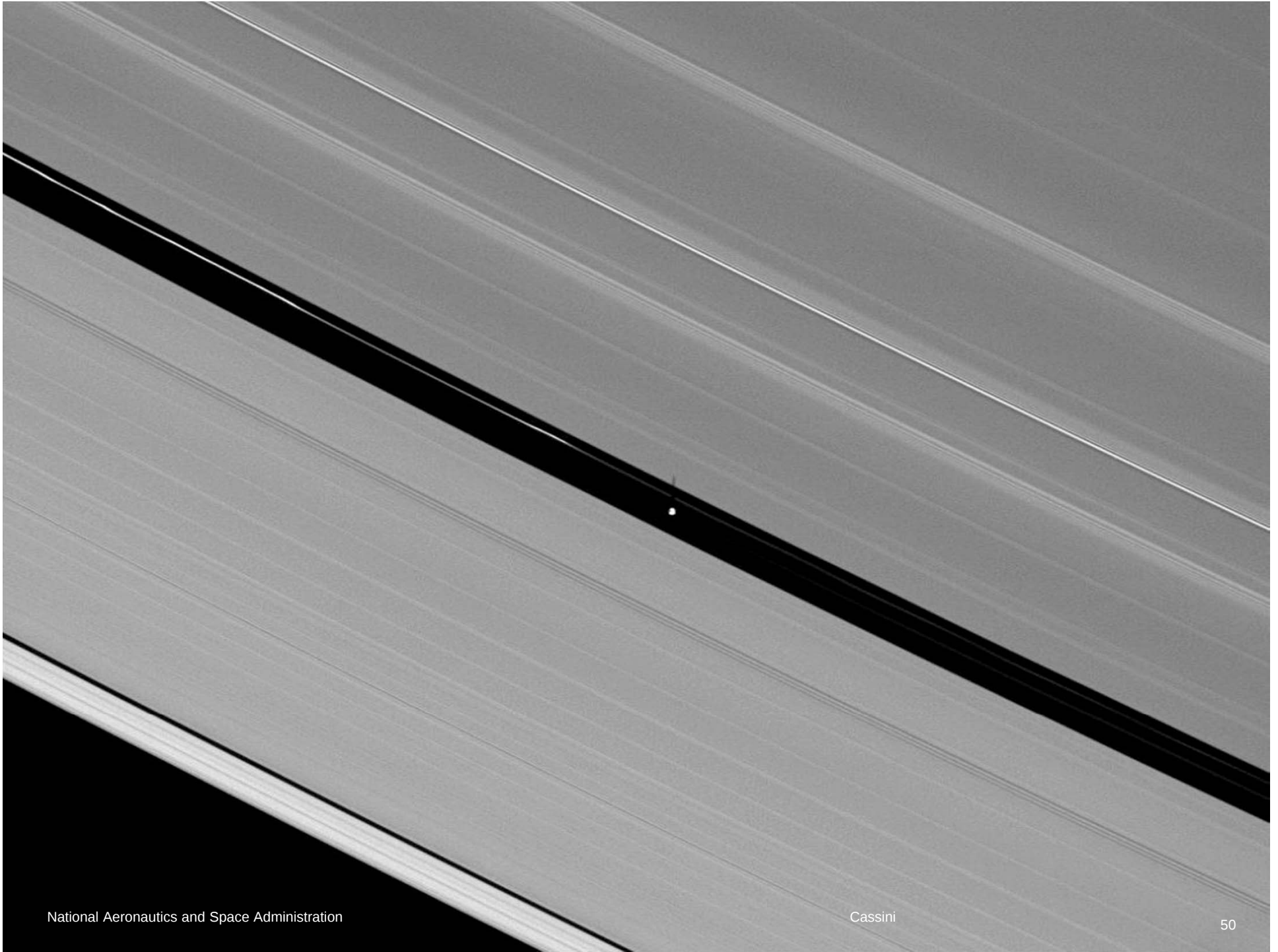


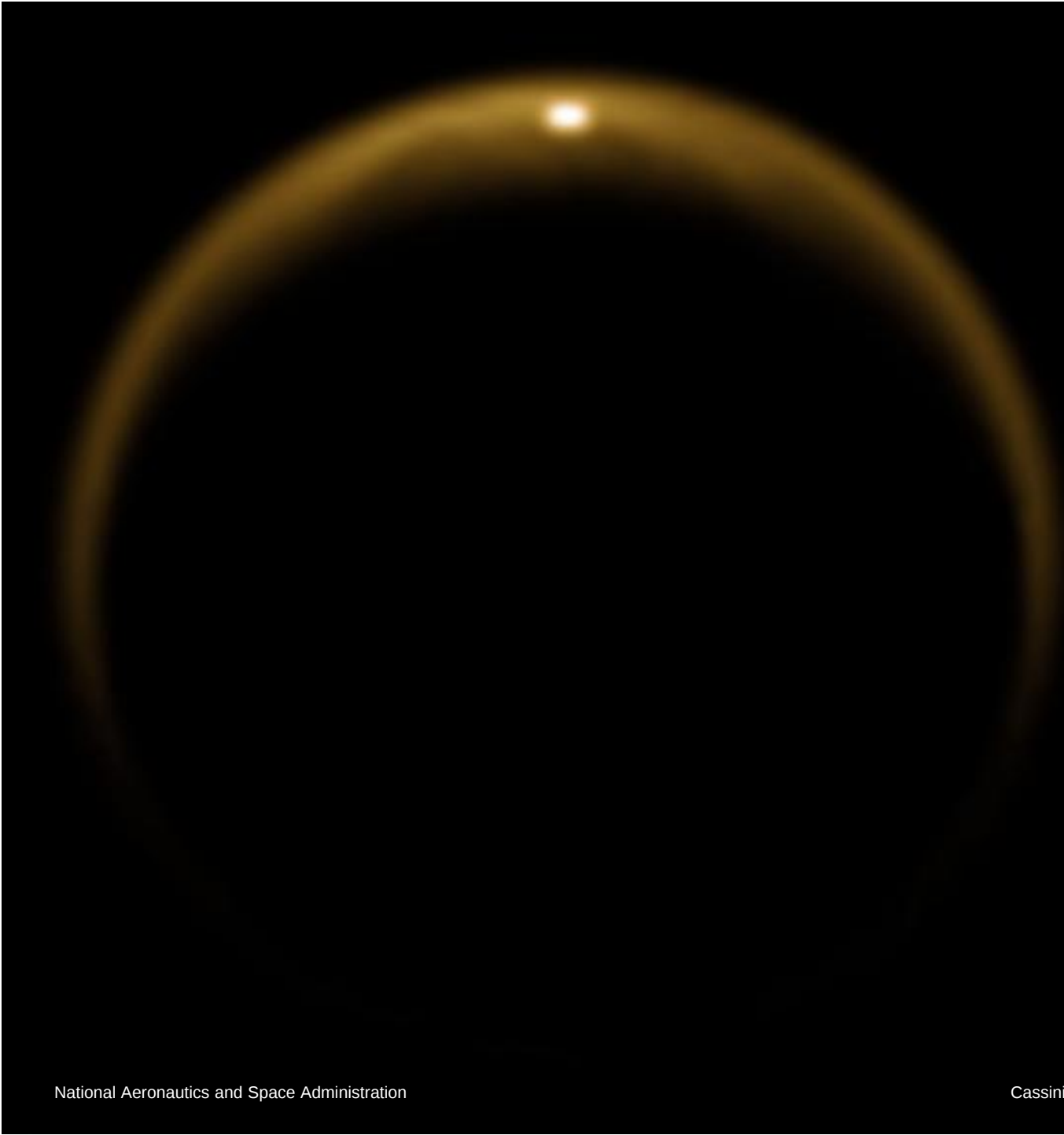


Pan (17 miles across) orbits in the Encke Gap, which runs through the center of the image. The small moon can be seen casting a faint, narrow shadow on the A ring above and to the right of the center of the image.

Janus (111 miles across) can be seen at the bottom right.

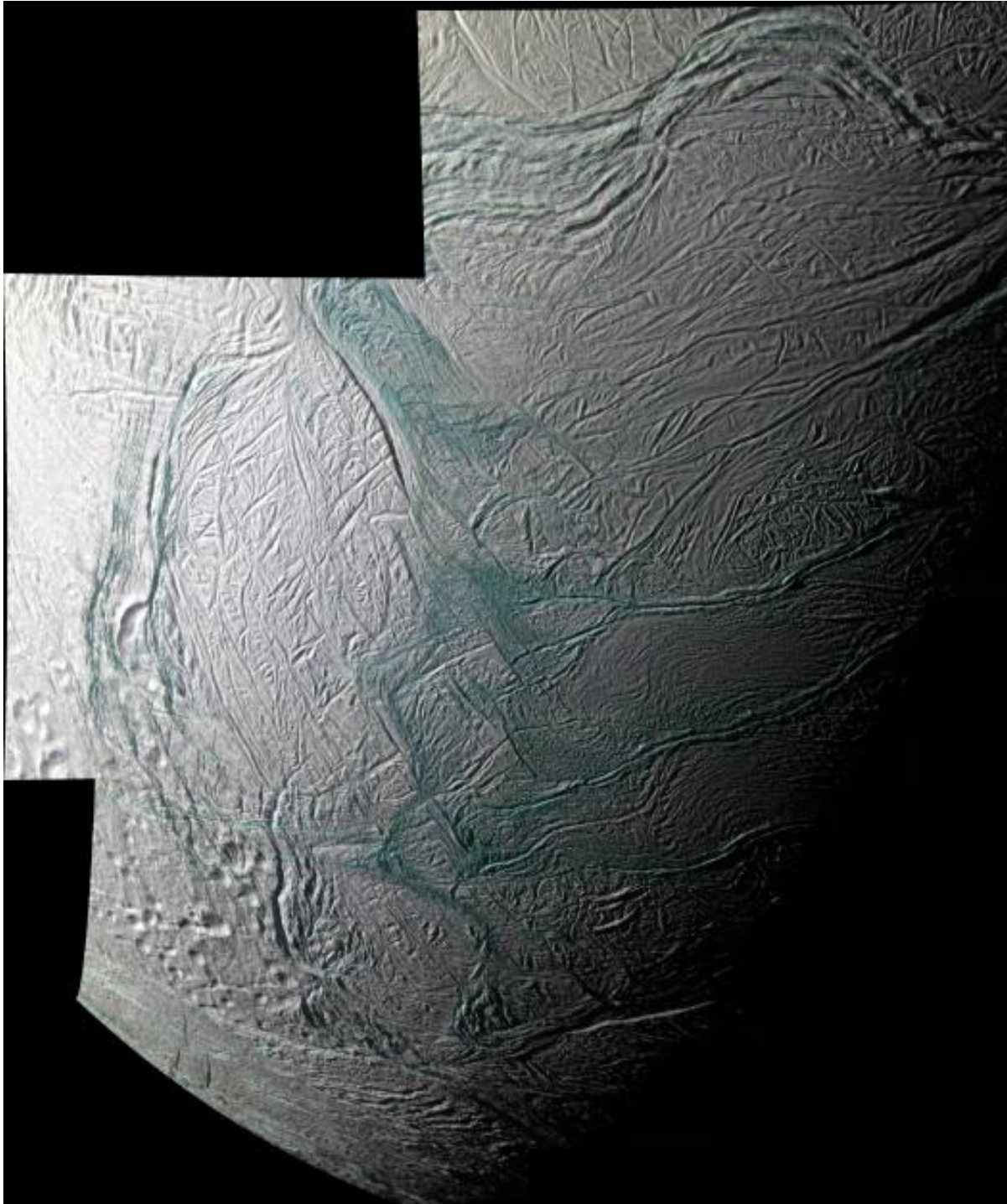
Picture taken by Cassini Narrow angle camera on September 13, 2009





Flash of sunlight reflected off a lake on Saturn's moon Titan confirming the presence of liquid on the Titan's northern hemisphere that was shrouded in darkness for nearly 15 years.

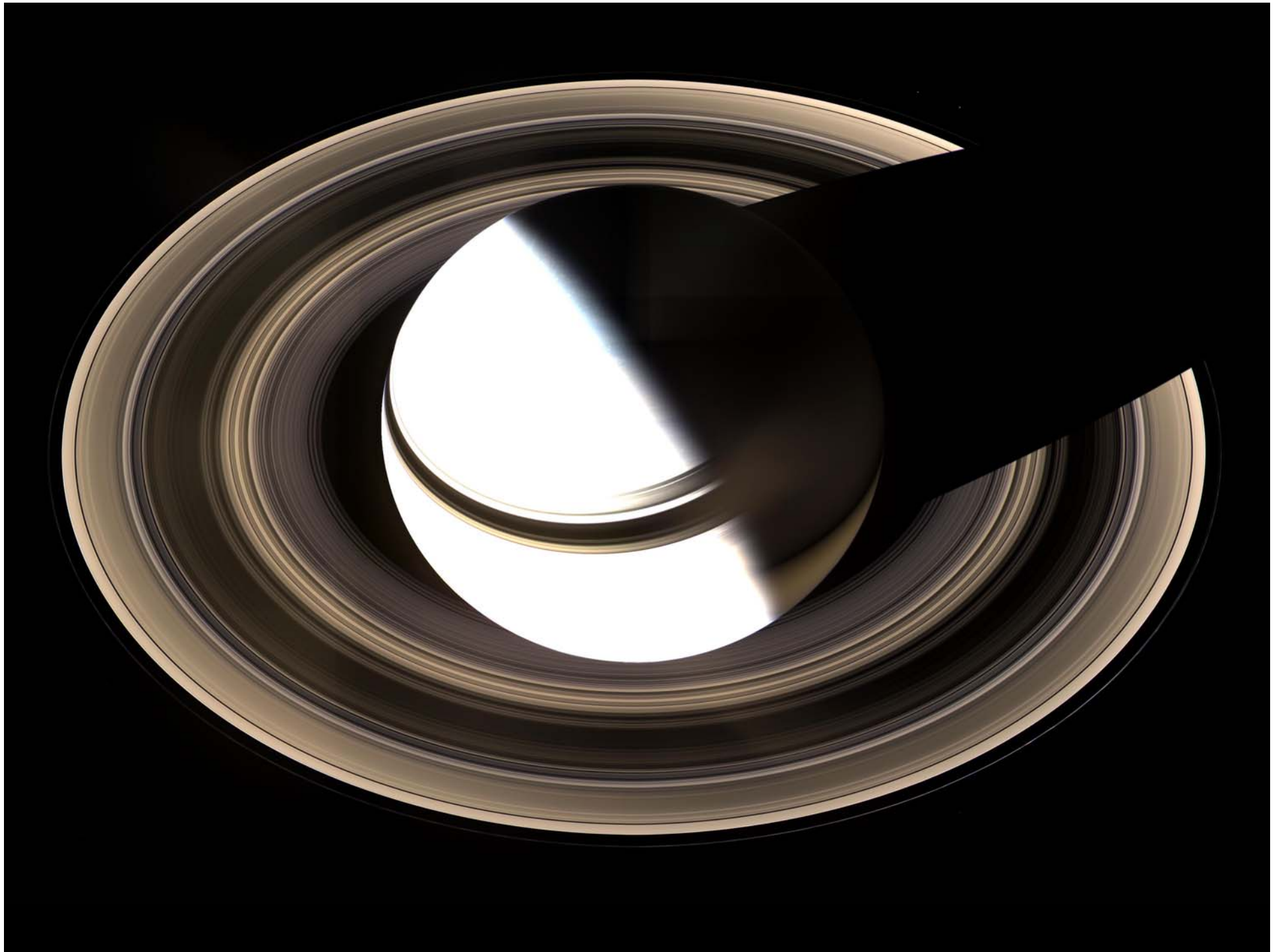
The image was captured on July 8, 2009 using Cassini Visual and Infrared Mapping Spectrometer (VIMS)



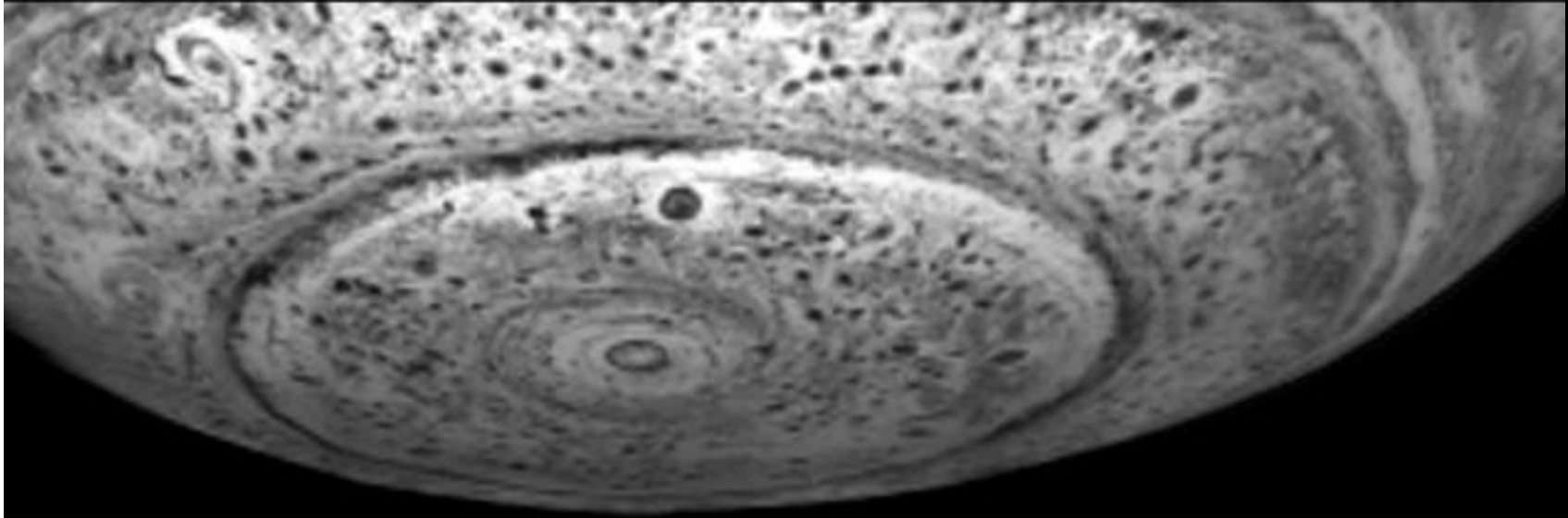
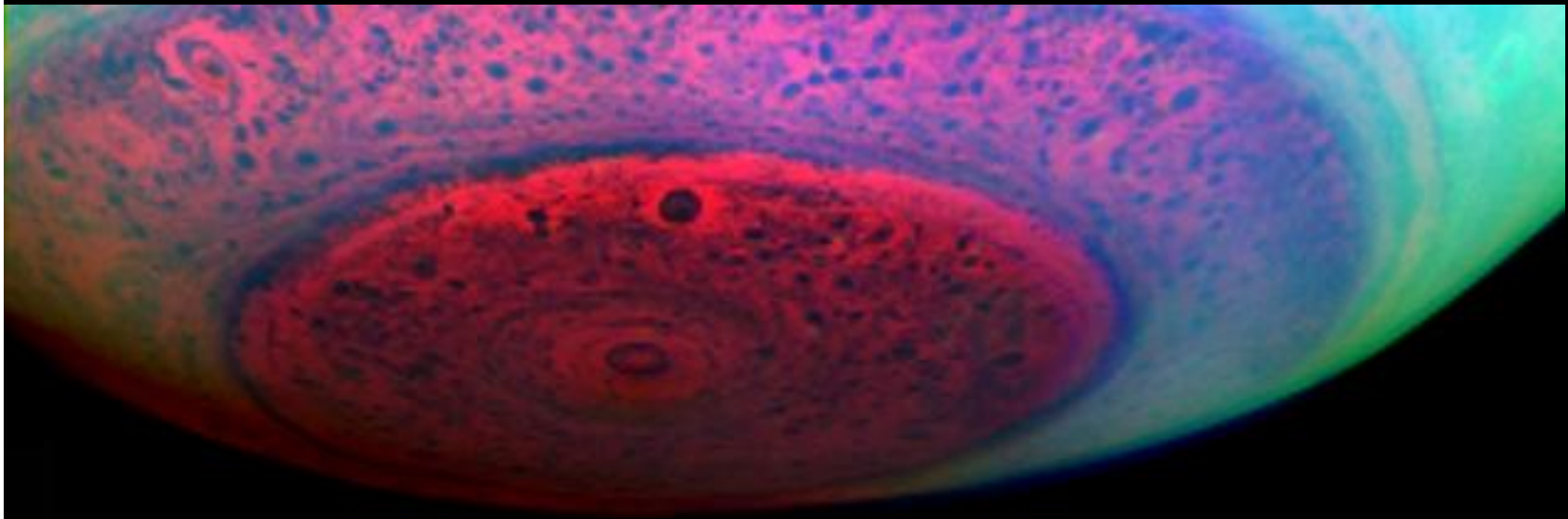
Imaging Science Subsystem (ISS) narrow-angle camera images obtained through ultraviolet, green, and near-infrared camera filters.

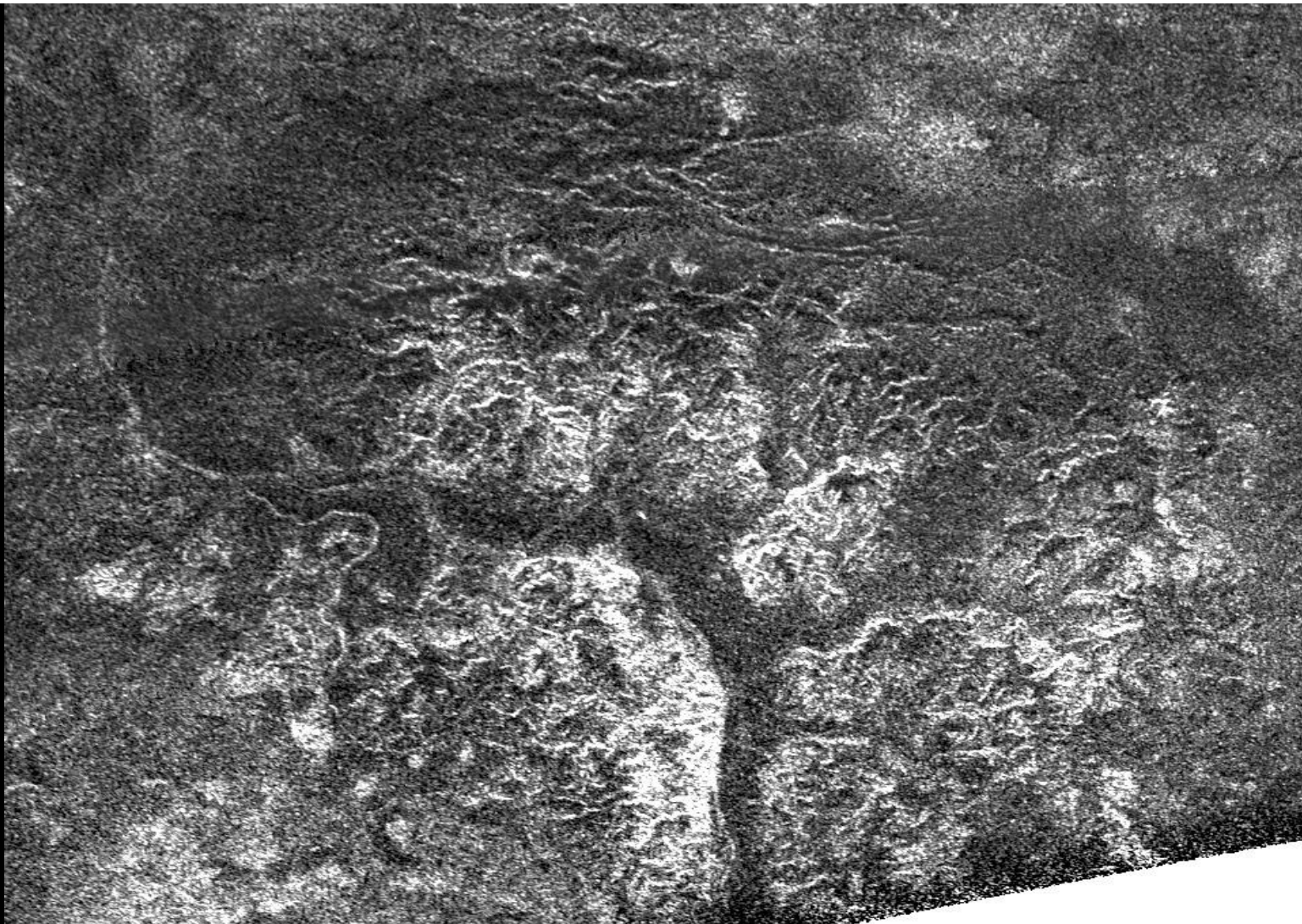
The original images ranged in resolution from 28 to 154 meters (92 to 505 feet) per pixel and were taken at distances ranging from 5,064 to 25,949 kilometers (3,140 to 15,468 miles) from Enceladus.

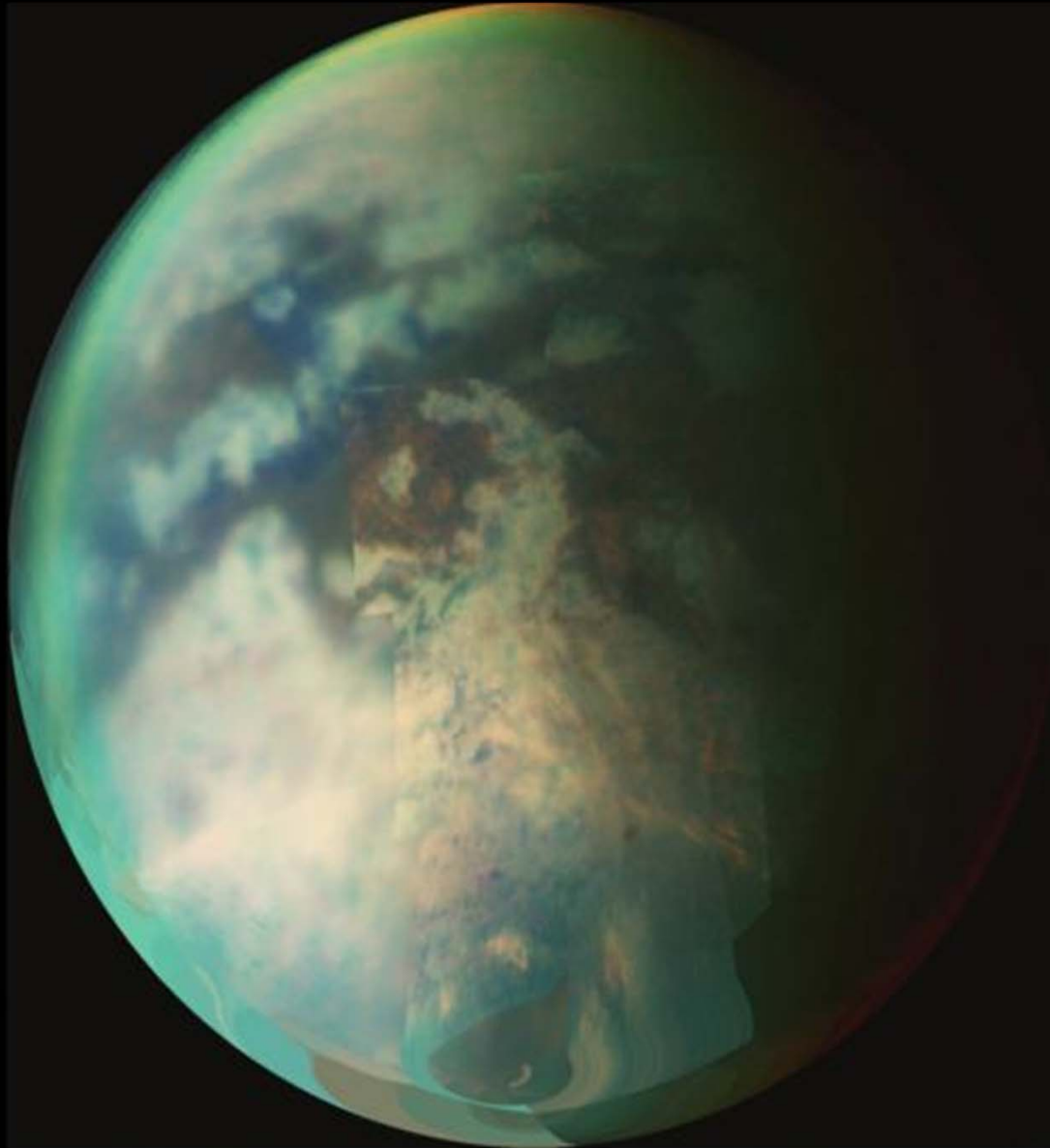
Areas that are greenish in appearance are believed to represent deposits of coarser grained ice and solid boulders. Whitish deposits represent finer grained ice. The mosaic shows that coarse-grained and solid ice are concentrated along valley floors and walls.





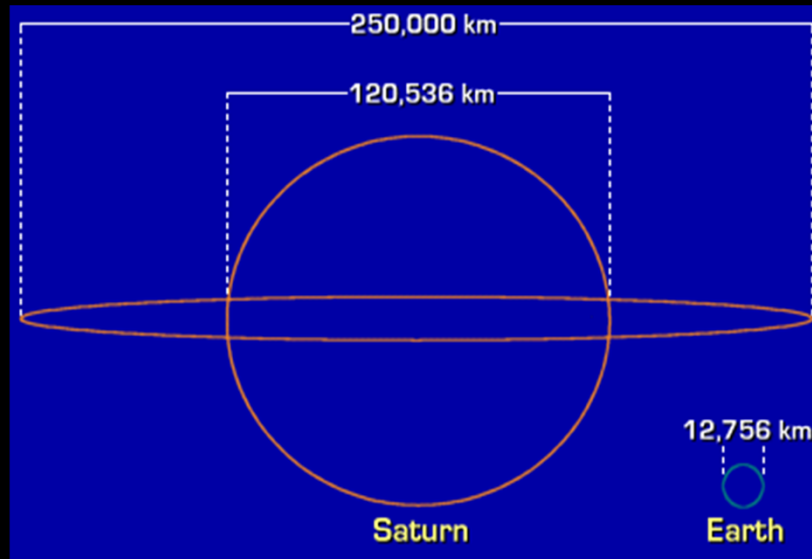








Saturn



National Aeronautics and Space Administration

Cassini

2

Associated Greek God: Kronos

6th planet from the Sun

2nd Largest Planet in our Solar System (Gas Giant)

Atmosphere: 75% Hydrogen, 25% Helium, traces of Methane, Ammonia and other hydrocarbons (Saturn has clouds, rain, snow, winds, lightning and storms)

Density: 0.7 gm/cm³ (Least dense of the planets)

Orbit from the Sun: 9.54 AU

Diameter: 120,536 km (74,975 mi)

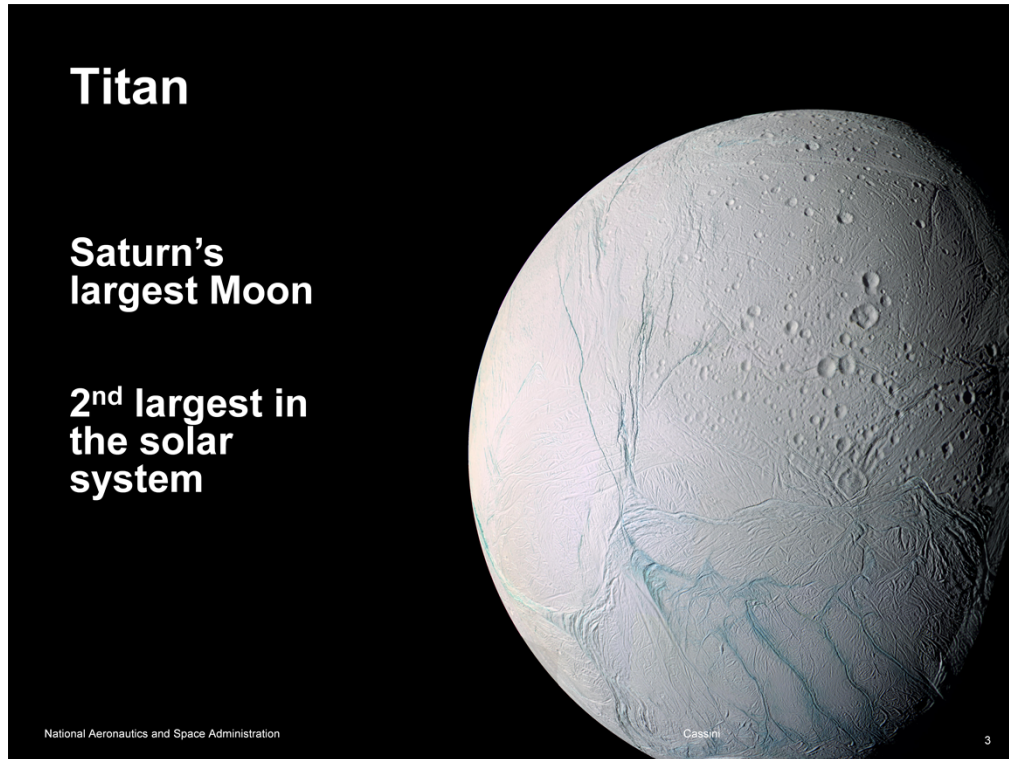
Length of day: 10 hr & 40 min (to spin around its axis)

Length of year: 29.42 (~30) Earth year

Rings : 7 (composed of water ice & rocky particles with icy coatings) – may disappear one day.

Moons: 60

1st visited by Pioneer 1 (1979), Voyager 1 & 2



Saturn's largest Moon

2nd largest in the solar system (after Ganymede of Jupiter)

Discovered in 1655 by Christiaan Huygens

Distance from Saturn: 1,221,870 km (759,200 mi)

Diameter: 5150 km (3199 mi)

Mass: 1/45 that of Earth

Density: 1.881 times that of Earth

Surface Temperature: -181 degree C (-294 degree F)

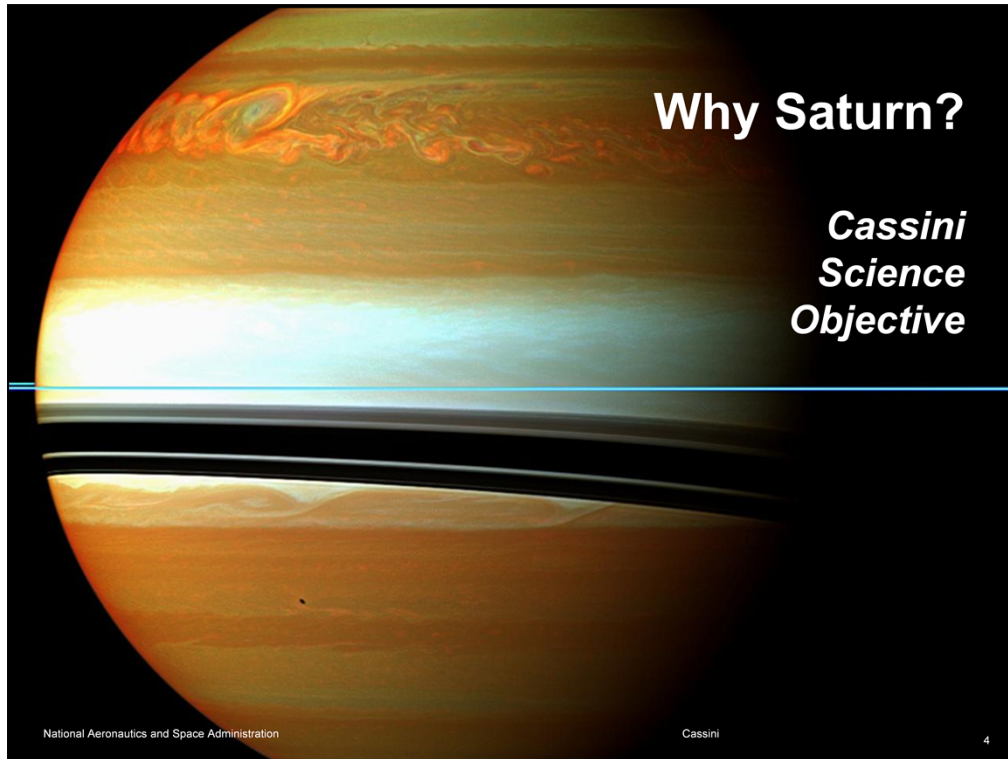
Surface Pressure: 1.5 bars (1.5 times that of Earth)

Composition: Nitrogen, Methane, traces of Ammonia, Argon, Ethane

Orbital Period: 16 Earth day

Only moon to have clouds & a thick planet-like atmosphere

Has an active atmosphere and complex Earth like processes that shape its surface



This false-color mosaic from NASA's Cassini spacecraft shows the tail of Saturn's huge northern storm.



- Determine Titan's atmospheric composition
- Investigate energy sources for atmospheric chemistry
- Study aerosol properties and cloud physics
- Measure winds and global temperatures
- Determine properties of Titan surface and internal structure
- Investigate the upper atmosphere and ionosphere

Cassini Mission

- **Launched 10-15-97 from CCAS on a Titan IV-B**
- **Arrived to Saturn: July 1, 2004 (traveled 2 billion miles)**
- **Mission was scheduled to end: June 30, 2008**

Launched 10-15-97 from CCAS on a Titan IV-B

Arrived to Saturn: July 1, 2004 (traveled 2 billion miles)

Mission was scheduled to end: June 30, 2008

Mission received a 27-month extension to Sept. 2010

Mission received a second extension to 2017 FY 2011 provided \$60 Million per year

Allows mission to continue until a few month past Northern Summer Solstice in May 2017 (Beginning of summer in Northern Hemisphere and winter in the southern Hemisphere)

Mission started in 2004 just after Saturn's Northern Winter Solstice

International effort : NASA, ESA, ISA & 17 nations

Largest interplanetary SC ever launched

Spacecraft & Huygens Probe

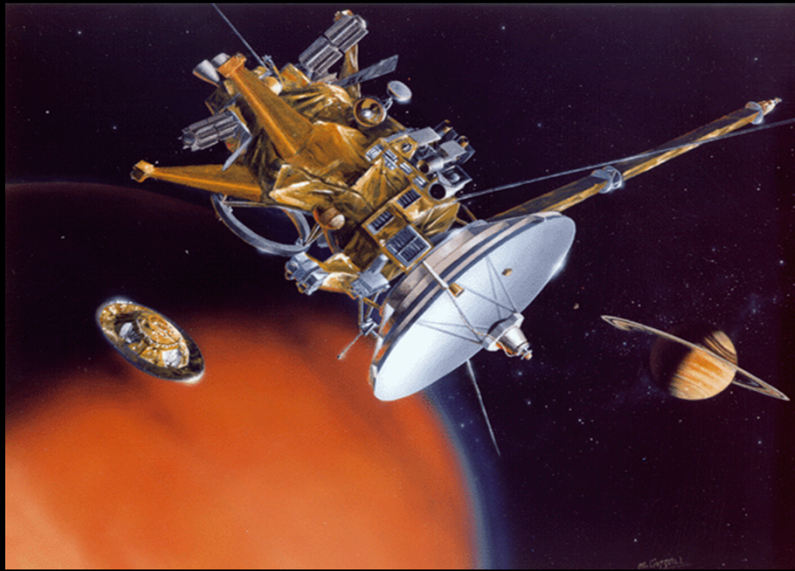
Spacecraft Named after Italian Astronomer Jean Dominique Cassini who discovered Iapetus, Rhea, Tethys and Dione. He discovered the narrow gap separating Saturn's rings known today as the "Cassini Division".

Probe named after Christian Huygens who in 1655 discovered Titan

12 science instruments

Mission Cost : \$ 3.27 Billion (US contribution \$2.6 billion / \$660 million from European)

Work carried out in 33 US States / > 5000 people worked on it



Cassini & Huygens Probe

Key Facts

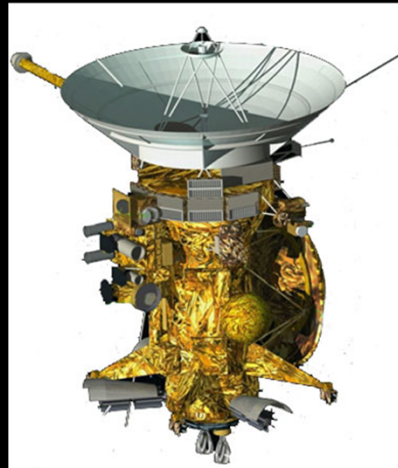
HUYGENS PROBE

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Orbit	Variable
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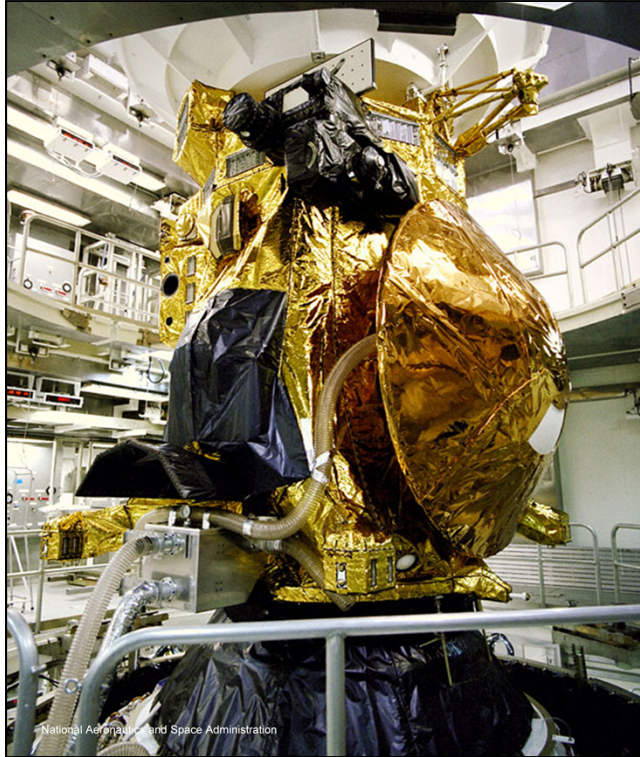
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More than 30 years have been invested in the engineering, safety analysis and testing of RTGs. Safety features are incorporated into the RTGs' design, and extensive testing has demonstrated that they can withstand physical conditions more severe than those expected from most accidents.



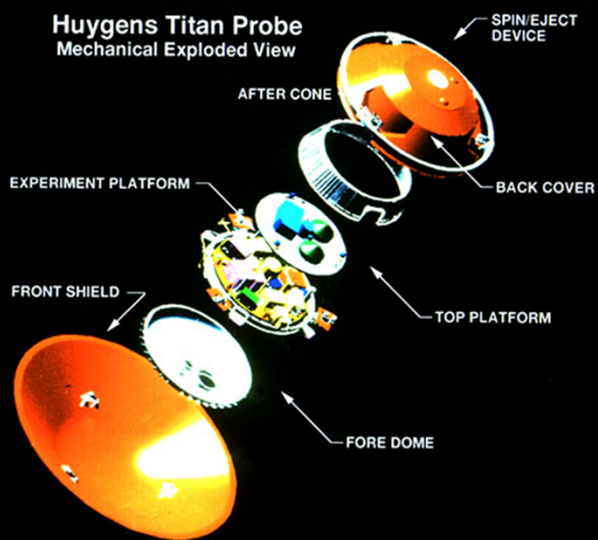
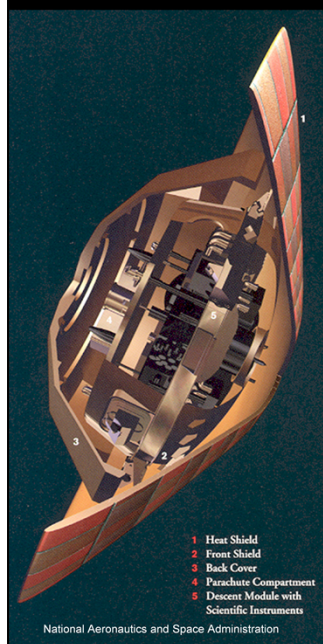
National Aeronautics and Space Administration

Huygens Probe @ the Pad

Cassini

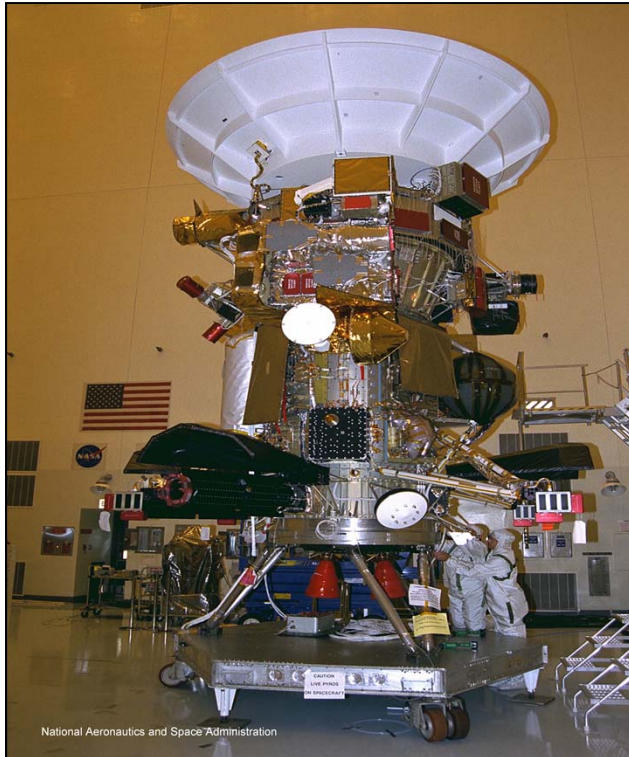
10

Huygens Probe Exploded View



Cassini

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National Aeronautics and Space Administration

Cassini Processing At the PHSF/ KSC

Cassini

12

Cassini processing in the ES at LC-40/CCAS

National Aeronautics and Space Administration



Cassini

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TITAN IV B Launched CASSINI on 10-15-97 from CCAS

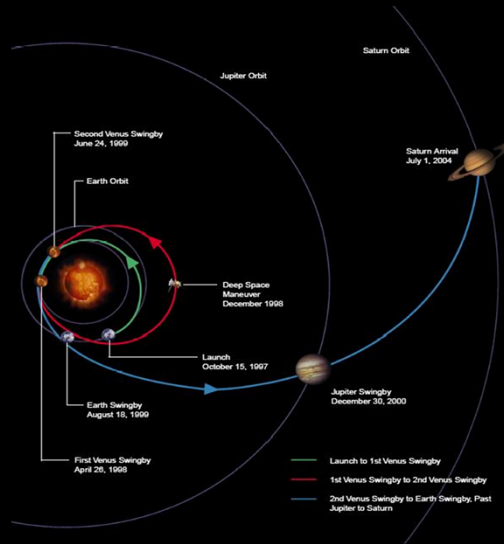
National Aeronautics and Space Administration

Cassini

14

Cassini's VVEJGA Trajectory

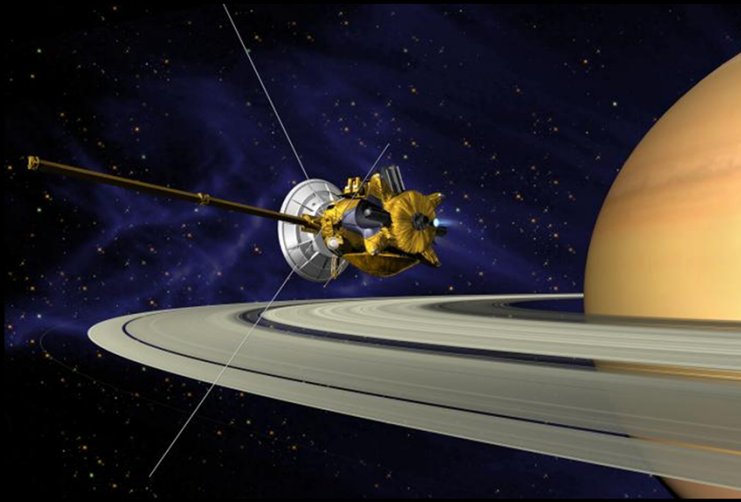
V:1998
V:1999
E:1999
J:2000
S:2004



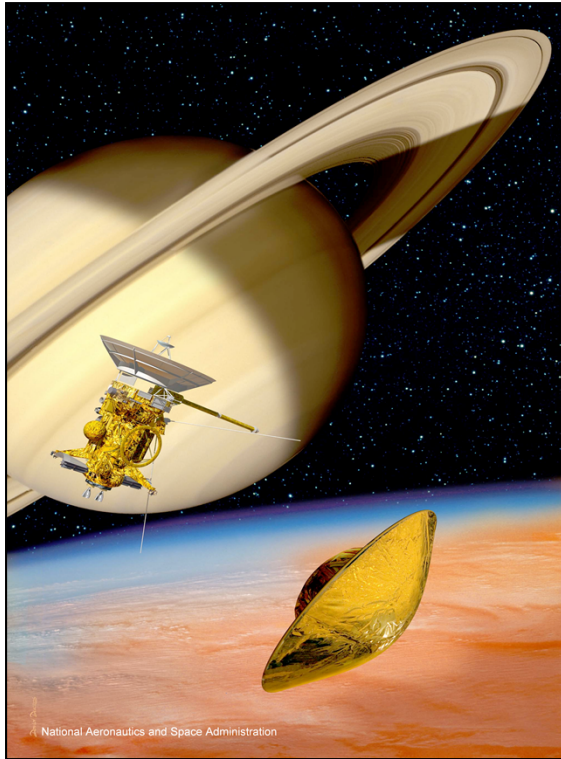
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Cassini

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SOI maneuver (90 minutes long) allowed Cassini to be captured by Saturn's gravity into a 5-month orbit.



National Aeronautics and Space Administration

Huygens will be the first spacecraft to land on a world in the outer Solar System

22 day cruise toward Titan

**In January 15, 2005
Huygens landed on the surface of Titan**

The Huygens data may offer clues about how life began on Earth.

Cassini

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One of the Landing Scenarios



National Aeronautics and Space Administration

Cassini

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Cassini Orbiter Instruments

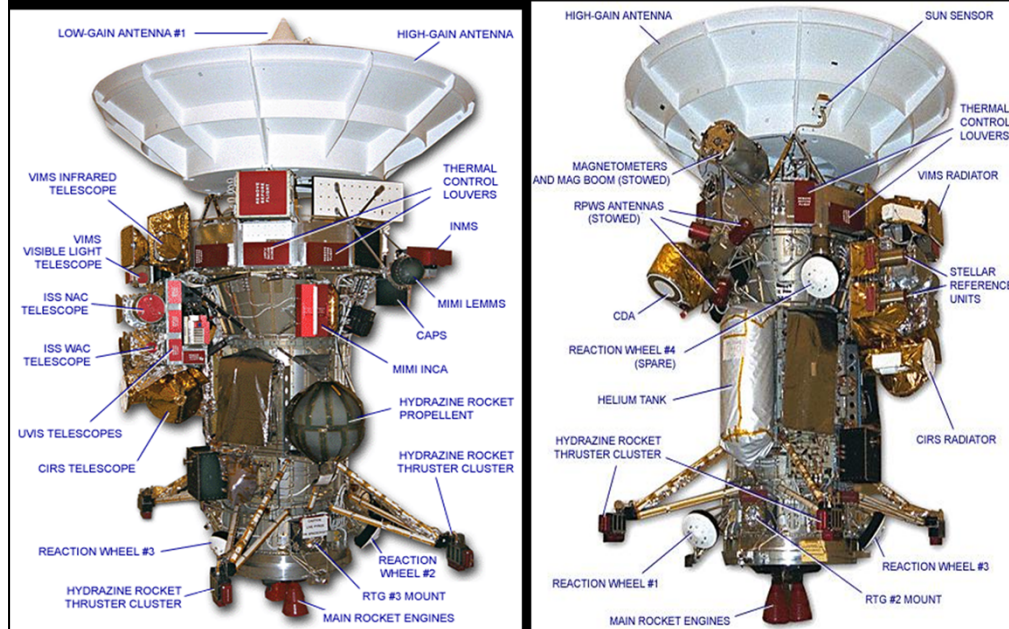
12 Instruments that Survey, sniff, analyze, scrutinize and take stunning images in various visible spectra.

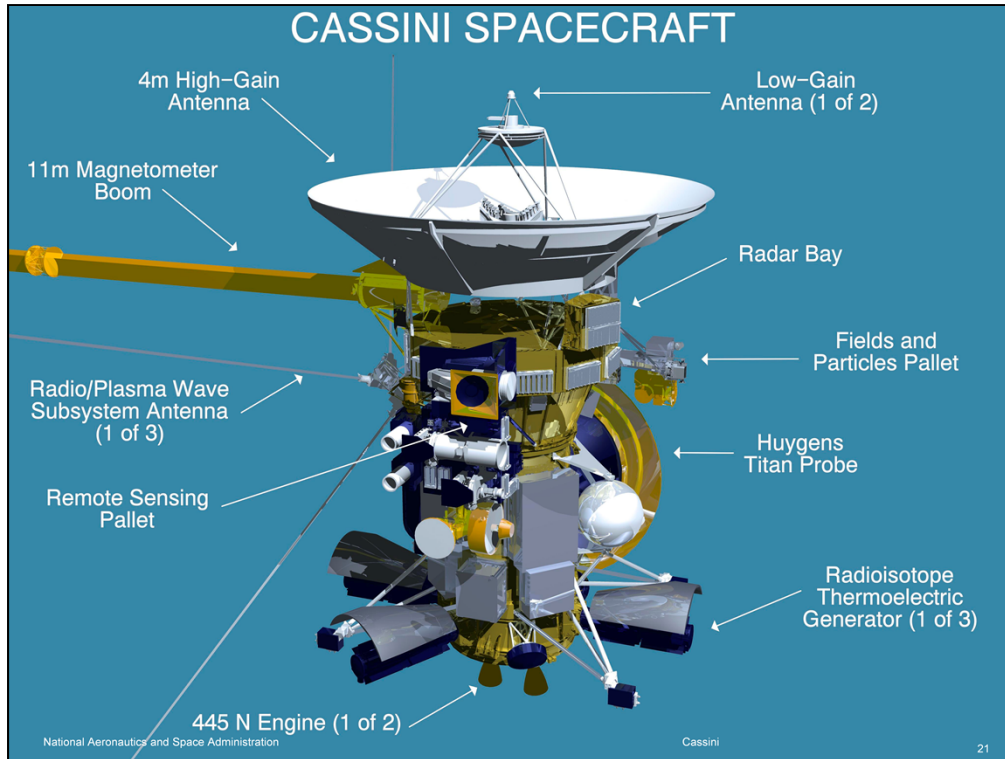
Optical Remote Sensing

Mounted on the remote sensing pallet, these instruments study Saturn and its rings and moons in the electromagnetic spectrum.

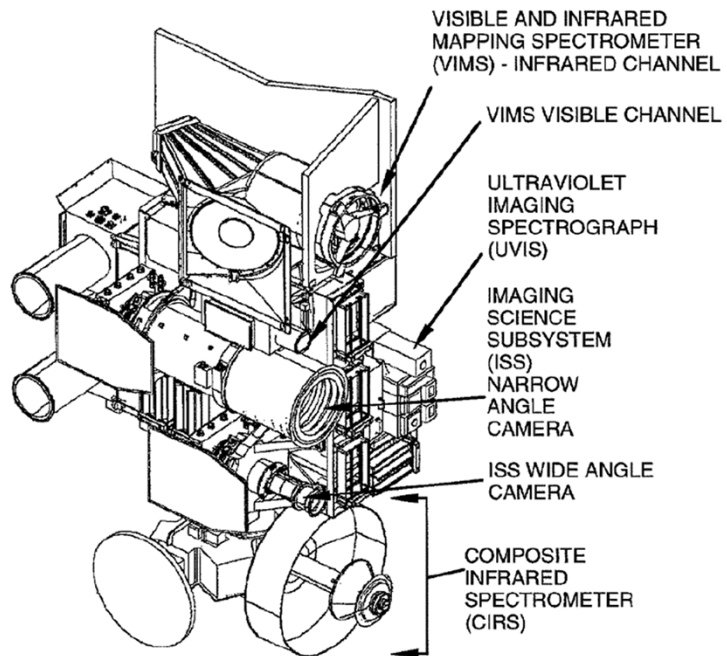
- 1.Composite Infrared Spectrometer (CIRS)**
- 2.Imaging Science Subsystem (ISS)**
- 3.Ultraviolet Imaging Spectrograph (UVIS)**
- 4.Visible and Infrared Mapping Spectrometer (VIMS)**

Cassini Spacecraft





REMOTE SENSING PALLET

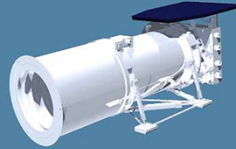


22

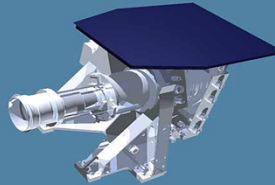
Cassini's Most Important instrument



ISS NAC
Imaging Science Subsystem
Narrow Angle Camera



ISS WAC
Imaging Science Subsystem
Wide Angle Camera



Space Science
Institute

National Aeronautics and Space Administration

Cassini

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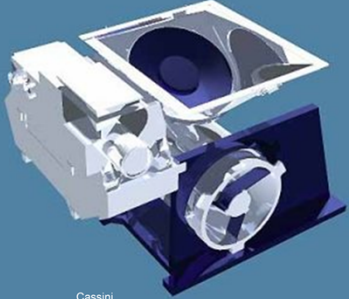
VIMS

VIMS
Visible and Infrared Mapping System

Creates maps of the color properties of the atmosphere of Saturn & Titan, the surfaces of the moons and the rings to study their composition and structure

Search for volatiles: Water Ice, CO₂
Search for minerals and organics

University of Arizona
National Aeronautics and Space Administration



Cassini

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The image is a composite slide. The top left shows a 3D model of the Cassini spacecraft with a yellow line pointing to a red instrument labeled 'VIMS'. The top right is a black rectangle. The middle right shows a 3D model of the VIMS instrument itself, a white box with a large circular lens and a blue base. The bottom left is a black box with white text describing the instrument's functions and its affiliation with the University of Arizona and NASA. The bottom right contains the labels 'Cassini' and '24'.

Fields, particles and Waves

Study the dust, plasma and magnetic field around Saturn.

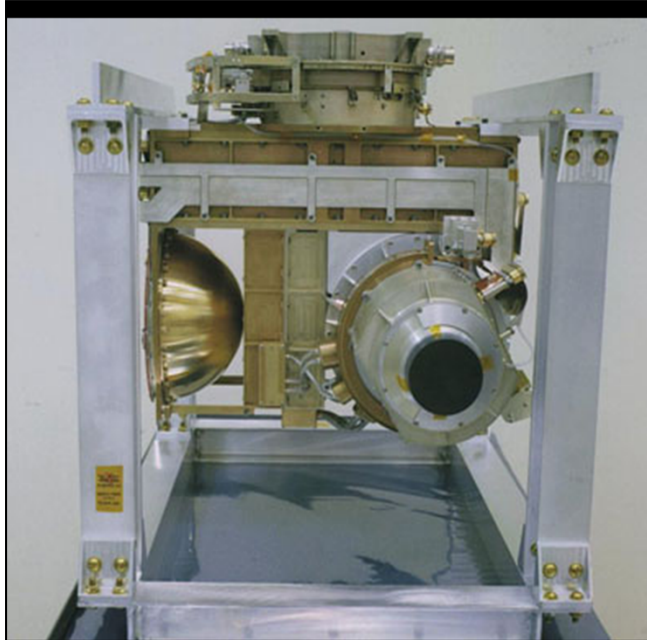
While most don't produce pictures the information they collect is critical to scientists Understanding of this rich environment

- 1.Cassini Plasma Spectrometer (CAPS)**
- 2.Cosmic Dust Analyzer (CDA)**
- 3.Ion and Neutral Mass Spectrometer (INMS)**
- 4.Magnetometer (MAG)**
- 5.Magnetospheric Imaging Instrument (MIMI)**
- 6.Radio and Plasma Wave Science (RPWS)**

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Cassini

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CAPS Cassini Plasma Spectrometer

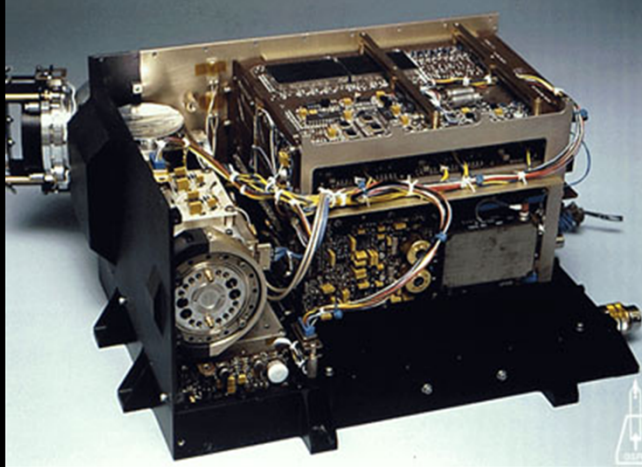
**Scoops up plasma
and measure its
composition,
density, speed, and
temp. throughout
Saturn 3 dimensional
magnetic field.**

**Southwest Research
Institute**

National Aeronautics and Space Administration

Cassini

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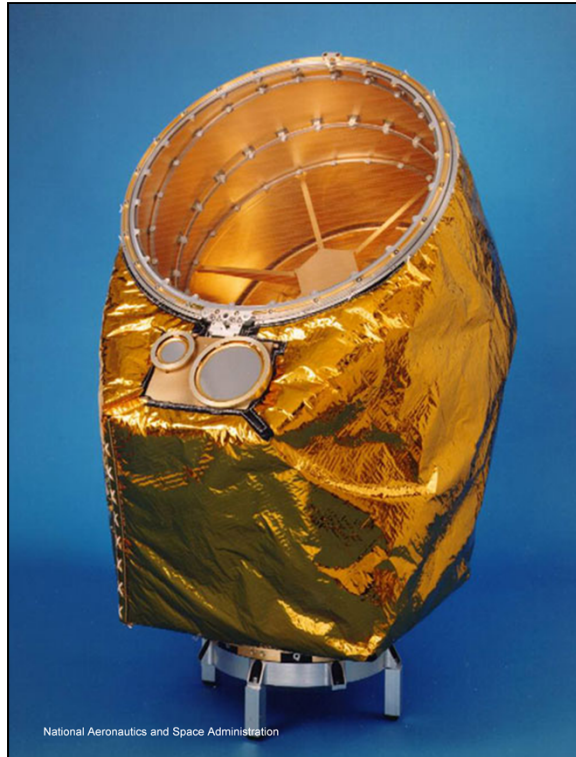
INMS (Ion and neutral Mass Spectrometer)

**Can detect neutral atoms and positively charged ions.
Scoops up material and determines the compositions and isotopic abundances
of chemical and elements in the upper reaches of Saturn and Titan's
atmosphere and Saturn E ring
Southwest Research Institute**

National Aeronautics and Space Administration

Cassini

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National Aeronautics and Space Administration

Cosmic Dust Analyzer (CDA)

Max Planck Institut für
Kernphysik

Cassini

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Microwave Remote Sensing

Using Radio waves these instruments map atmospheres, determine the mass of moons, Collect data on ring particle size, and unveil the surface of Titan

1.Radar

2.Radar Science (RSS)

Huygens Instruments

Aerosol Collector and Pyrolyser (ACP)

Collect aerosols for chemical-composition analysis

Descent Imager / Spectral Radiometer (DISR)

Images and spectra of the surface material

Doppler Wind Experiment (DWE)

Uses Radio signals to deduce atmospheric properties

Gas Chromatograph and Mass Spectrometer (GCMS)

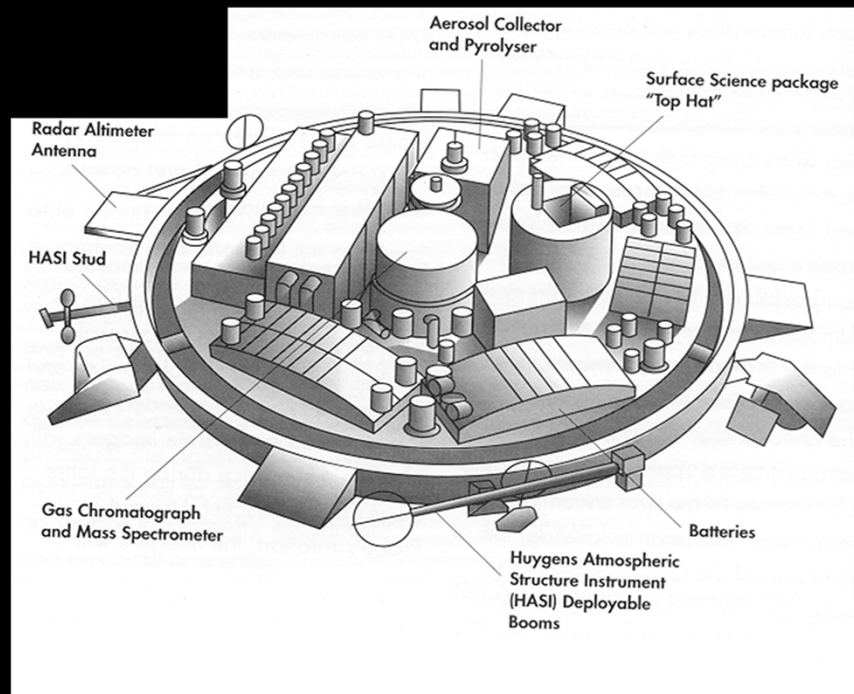
Chemical analyzer designed to identify and quantify various atmospheric constituents

Huygens Atmospheric Structure Instrument (HASI)

Comprises sensors for measuring the physical and electrical properties of the atmosphere and an on board microphone to send back sounds from Titan

Surface Science Package (SSP)

Suites of sensors to determine the physical properties at the surface at the impact site



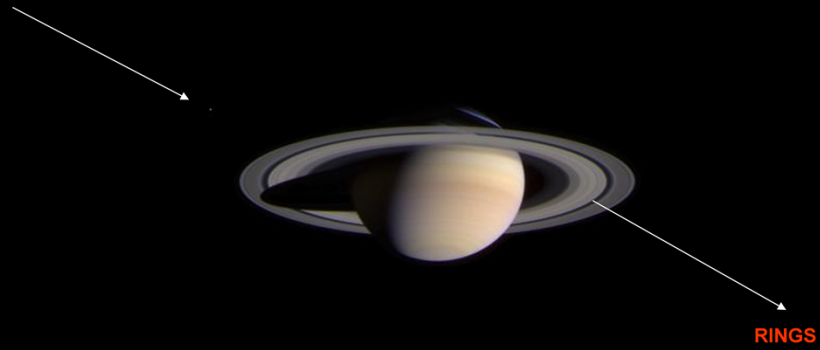
FINDINGS FROM CASSINI & HUYGENS

National Aeronautics and Space Administration

Cassini

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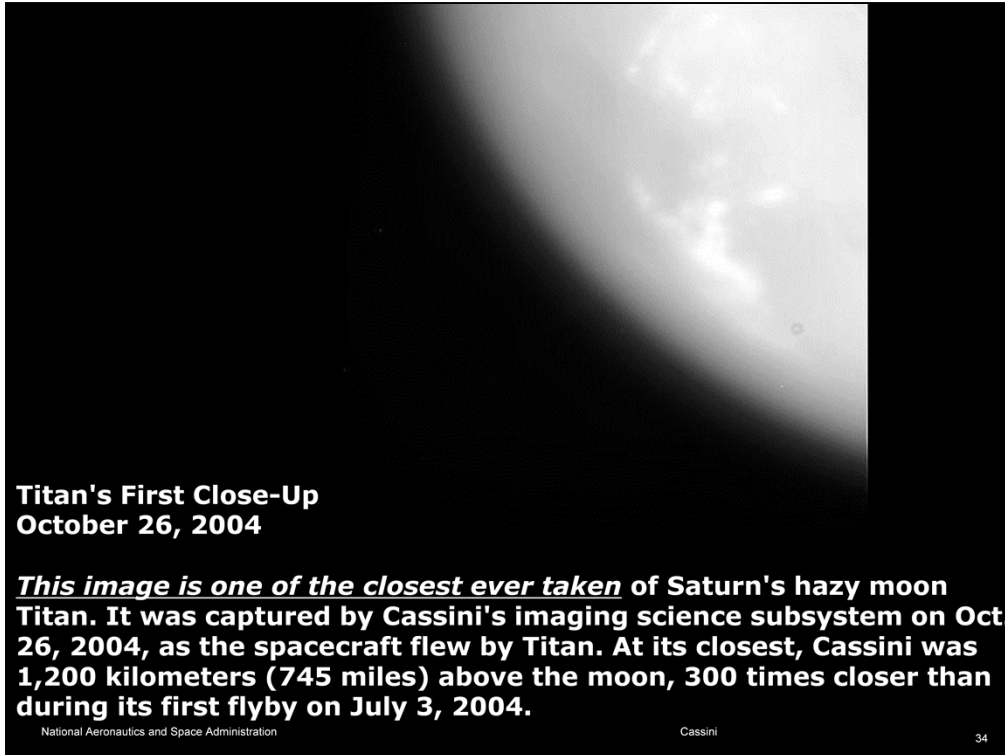
Approach to Saturn Feb 9, 2004



National Aeronautics and Space Administration

Cassini

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**Titan's First Close-Up
October 26, 2004**

This image is one of the closest ever taken of Saturn's hazy moon Titan. It was captured by Cassini's imaging science subsystem on Oct. 26, 2004, as the spacecraft flew by Titan. At its closest, Cassini was 1,200 kilometers (745 miles) above the moon, 300 times closer than during its first flyby on July 3, 2004.

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Cassini

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Two pairs of Storms June 4, 2004

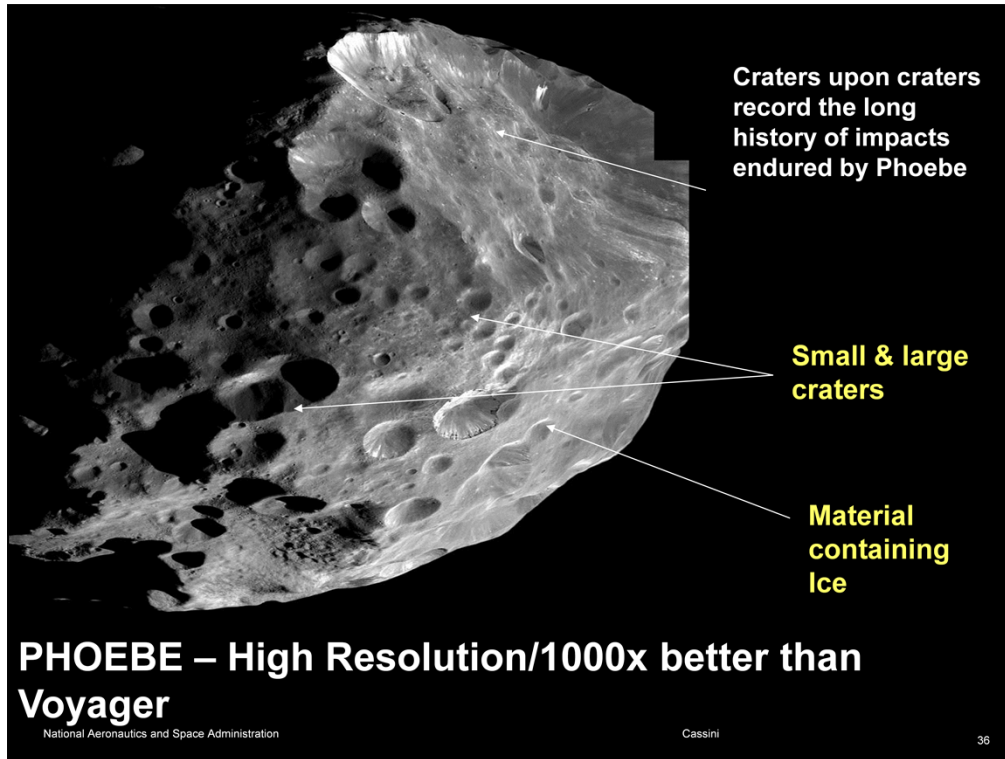
Storms

Cassini narrow angle detected

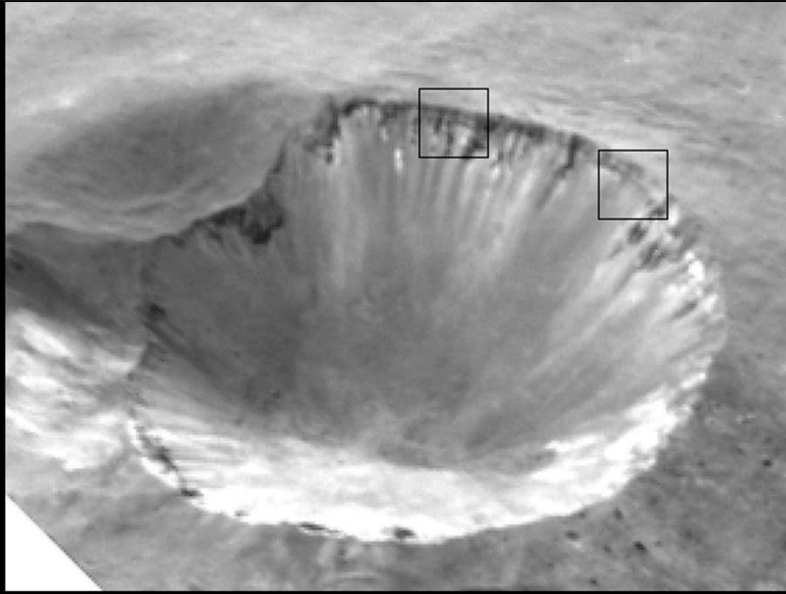
National Aeronautics and Space Administration

Cassini

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**Large Crater
on Phoebe**



Crater Close-up on Phoebe June 13, 2004

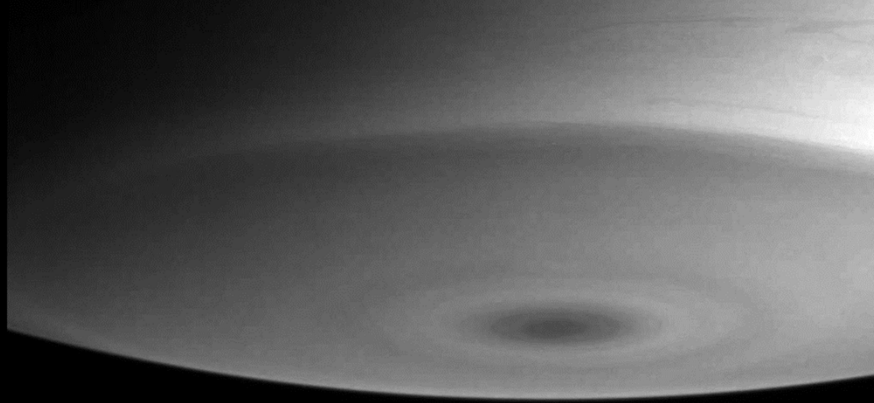
National Aeronautics and Space Administration

Cassini

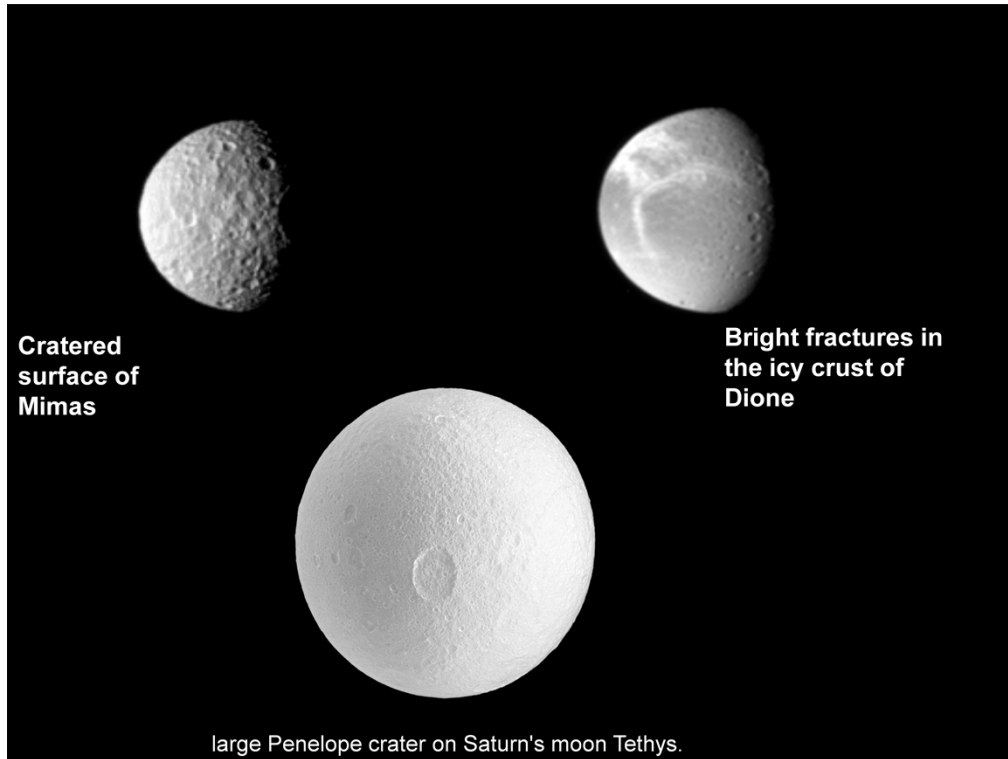
37

Saturn's Polar Structure

August 4 2004



Saturn's southern polar region exhibits concentric rings of clouds which encircle a dark spot at the pole. To the north and toward the right, wavy patterns are evident, resulting from the atmosphere moving with different speeds at different latitudes. The image was taken with the Cassini spacecraft narrow angle camera from a distance of 5 million kilometers (3.1 million miles) from Saturn,.



**Cratered
surface of
Mimas**

**Bright fractures in
the icy crust of
Dione**

large Penelope crater on Saturn's moon Tethys.



The surface is stained by roughly north-south trending wispy streaks of dark material.

The absence of an atmosphere on Iapetus means that the material was deposited by some means other than precipitation, such as ballistic emplacement of material from elsewhere on the moon, or deposition of infalling material from elsewhere in the Saturn system.

Images taken in infrared, green, and ultraviolet light filters were combined to create this image. The view was obtained from a distance of about 172,900 kilometers (107,435 miles) from Iapetus.

Dark-stained Iapetus in unrivaled clarity

December 31, 2004



Giant oval in the ringed planet's southern hemisphere that is somewhat smaller than, but resembles in appearance, Jupiter's long-lived Great Red Spot.



Dark belt

bright zones

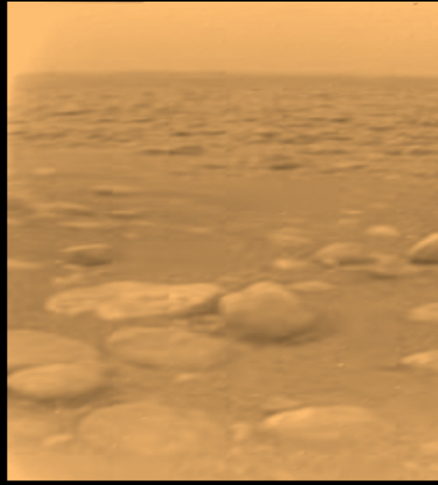
boundary turbulence due to wind shear and density differences between adjacent bands

National Aeronautics and Space Administration

Cassini

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1st Picture of Titan



One of the first images taken by Huygens. Titan's surface is darker than scientists expected and is likely a mixture of water ice and hydrocarbons.

National Aeronautics and Space Administration

Cassini

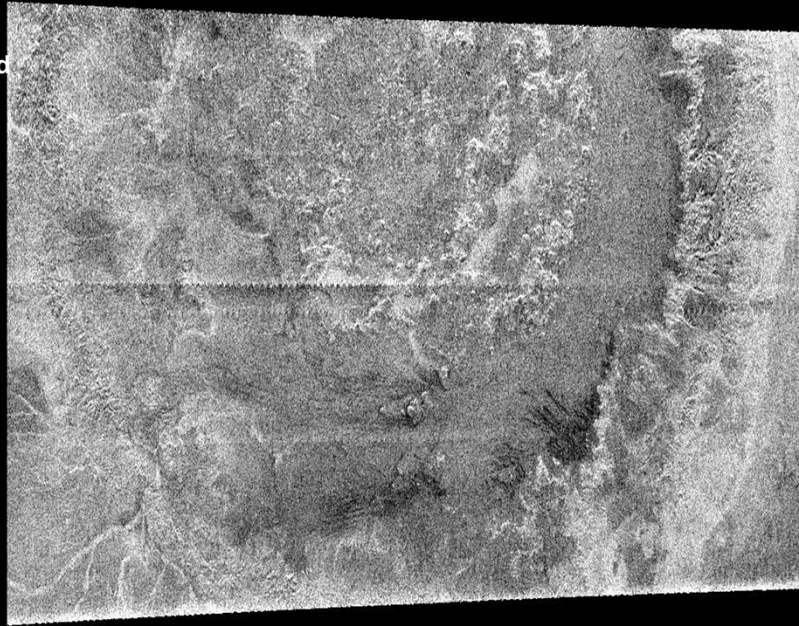
43

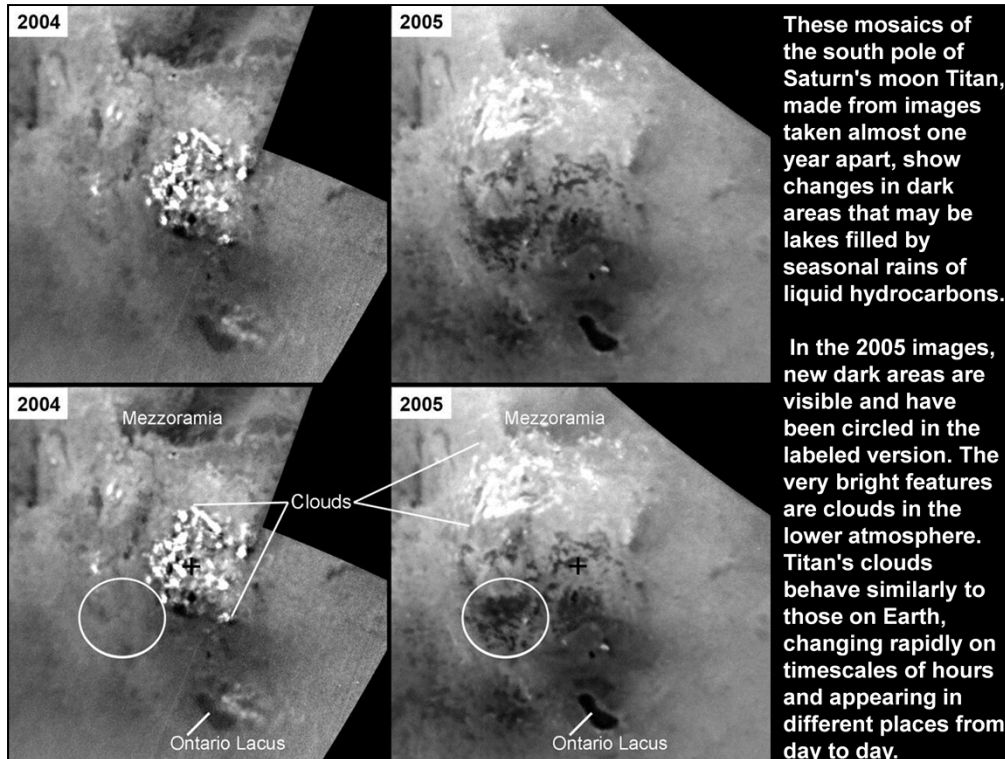
Circus Maximus- February 16, 2005

first impact
feature identified
in radar images
of Titan.

huge annular
feature with an
outer diameter
of ~ 440
kilometers (273
miles).

Resembles a
large crater or
part of a ringed
basin, either of
which could be
formed when a
comet or
asteroid tens of
kilometers in
size slammed
into Titan.





Mimas Blues

Mimas drifts along in its orbit against the azure backdrop of Saturn's northern latitudes in this true color view.

Images taken using infrared (930 nanometers), green (568 nanometers) and ultraviolet (338 nanometers) spectral filters were combined. The colors have been adjusted to match closely what the scene would look like in natural color.

The images were obtained using the Cassini spacecraft narrow angle camera on Jan. 18, 2005, at a distance of approximately 1.4 million kilometers (870,000 miles) from Saturn.

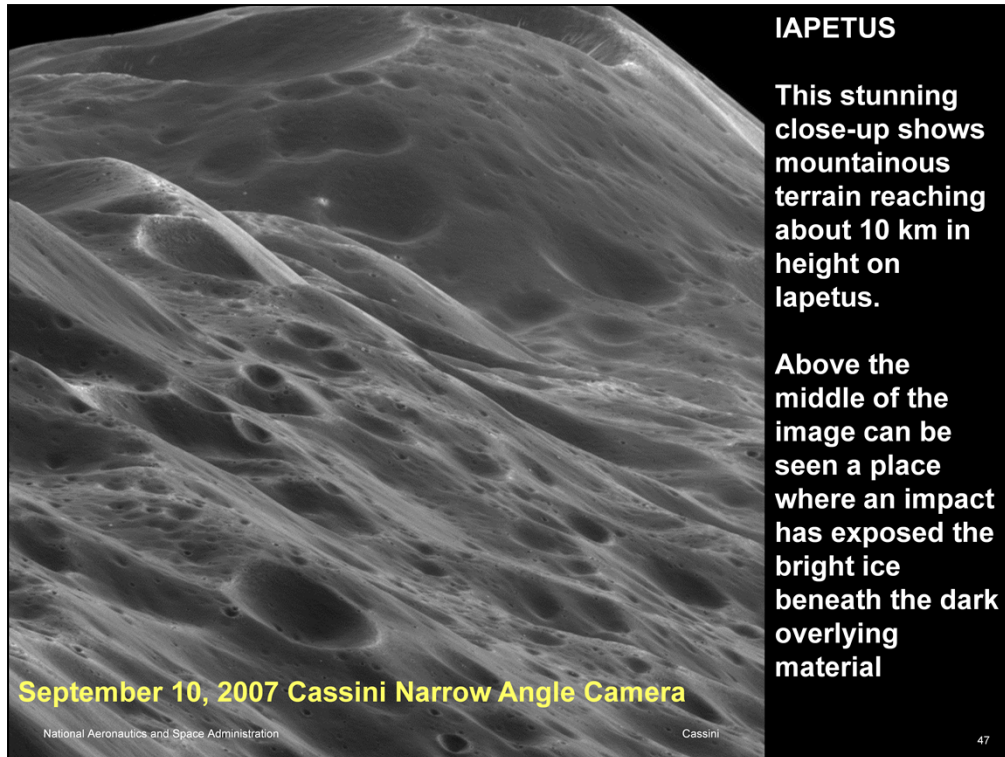


Jan 18, 2005

National Aeronautics and Space Administration

Cassini

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IAPETUS

This stunning close-up shows mountainous terrain reaching about 10 km in height on Iapetus.

Above the middle of the image can be seen a place where an impact has exposed the bright ice beneath the dark overlying material

September 10, 2007 Cassini Narrow Angle Camera

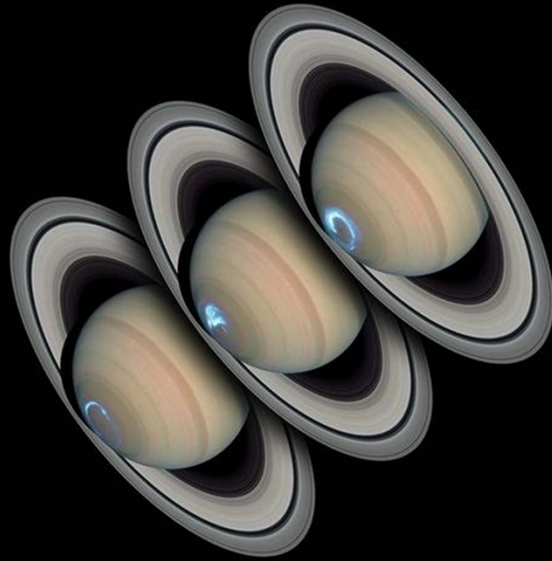
National Aeronautics and Space Administration

Cassini

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Saturn's Auroras

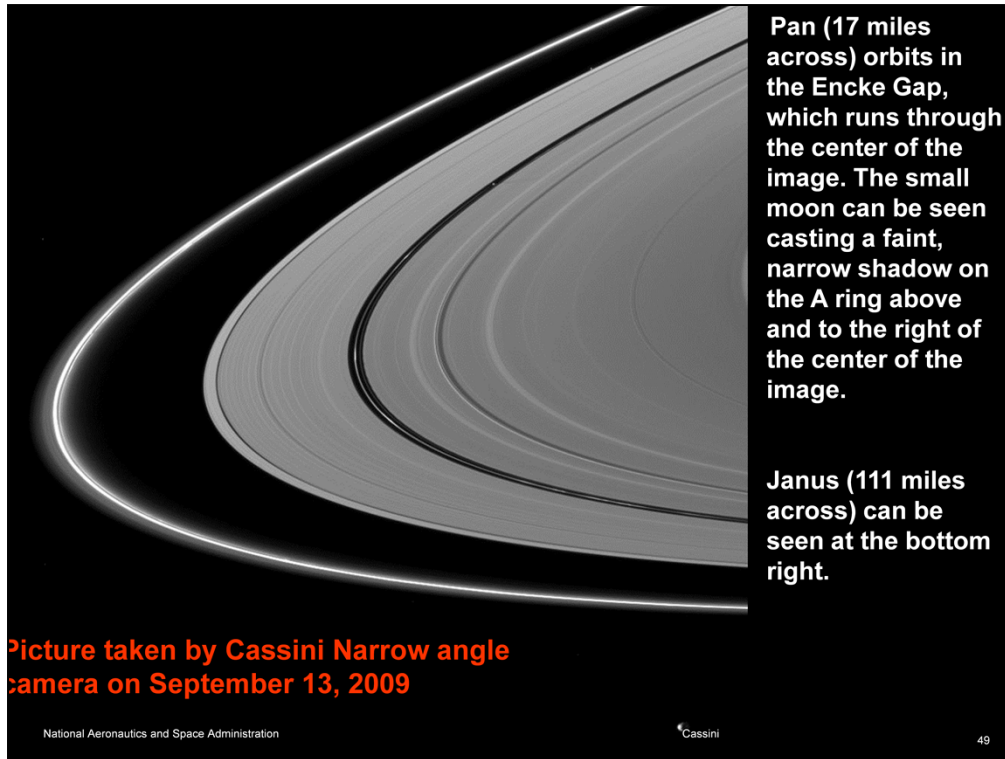
February 16, 2005



National Aeronautics and Space Administration

Cassini

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Pan (17 miles across) orbits in the Encke Gap, which runs through the center of the image. The small moon can be seen casting a faint, narrow shadow on the A ring above and to the right of the center of the image.

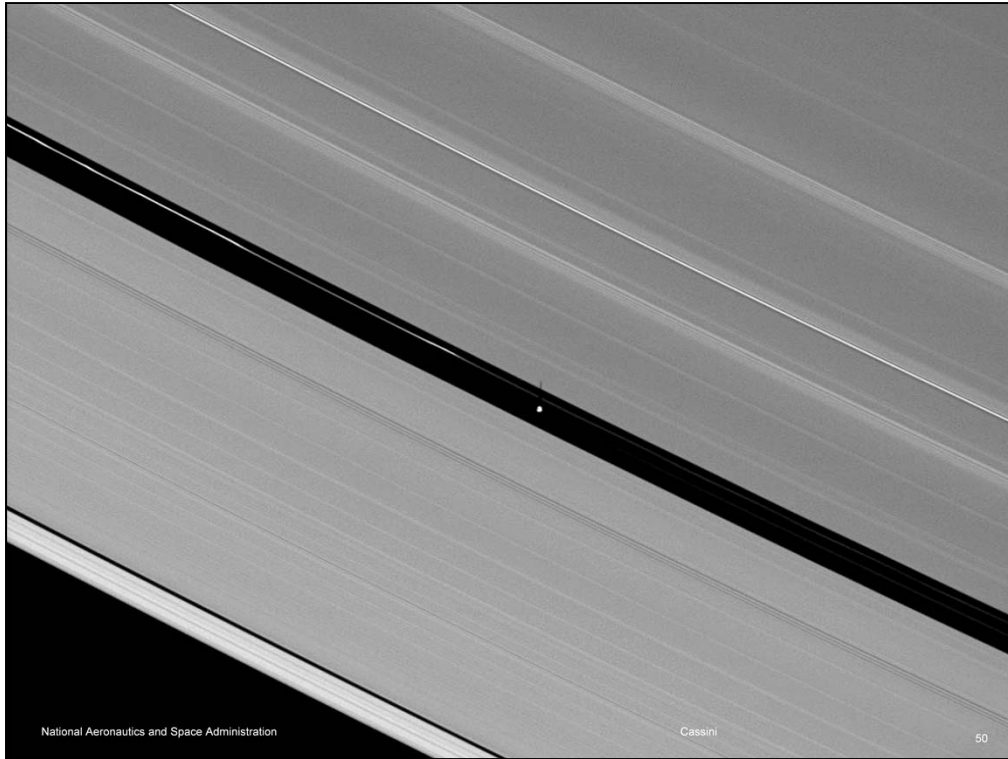
Janus (111 miles across) can be seen at the bottom right.

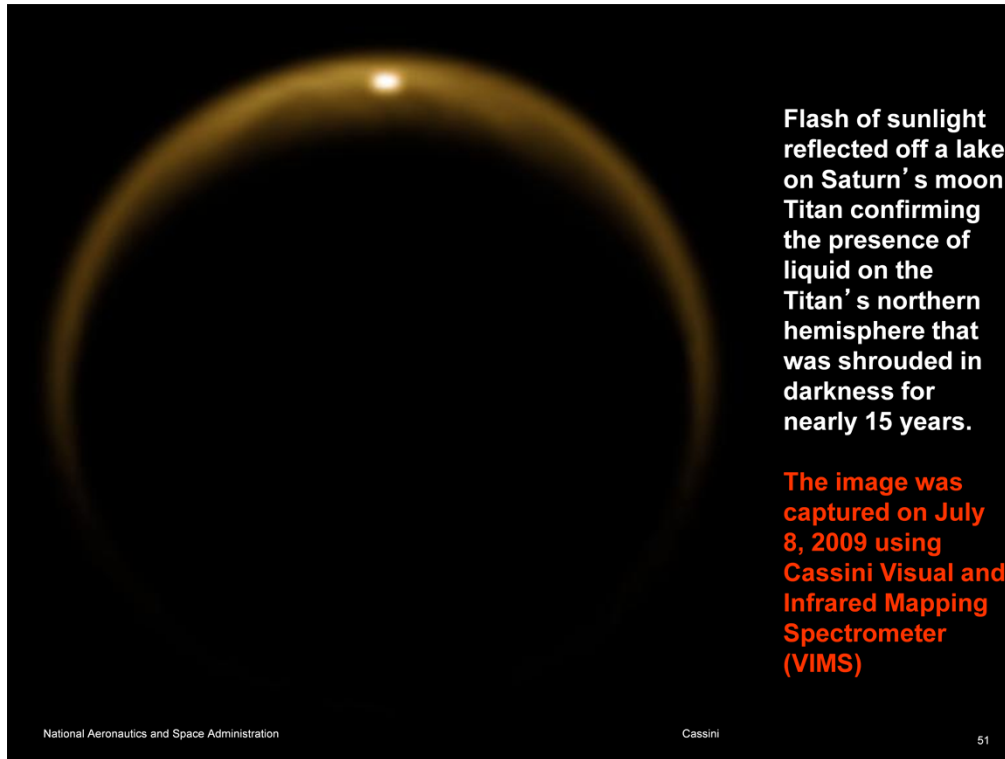
Picture taken by Cassini Narrow angle camera on September 13, 2009

National Aeronautics and Space Administration

Cassini

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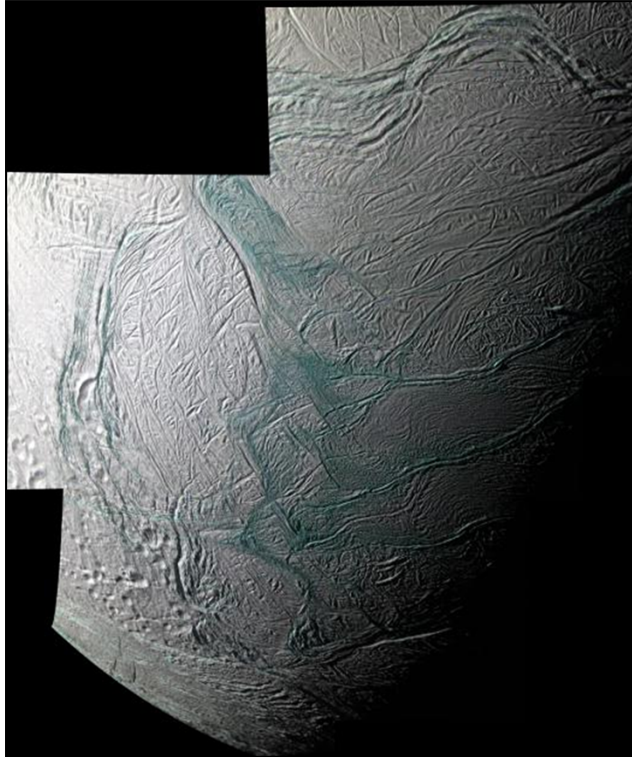
Flash of sunlight reflected off a lake on Saturn's moon Titan confirming the presence of liquid on the Titan's northern hemisphere that was shrouded in darkness for nearly 15 years.

The image was captured on July 8, 2009 using Cassini Visual and Infrared Mapping Spectrometer (VIMS)

National Aeronautics and Space Administration

Cassini

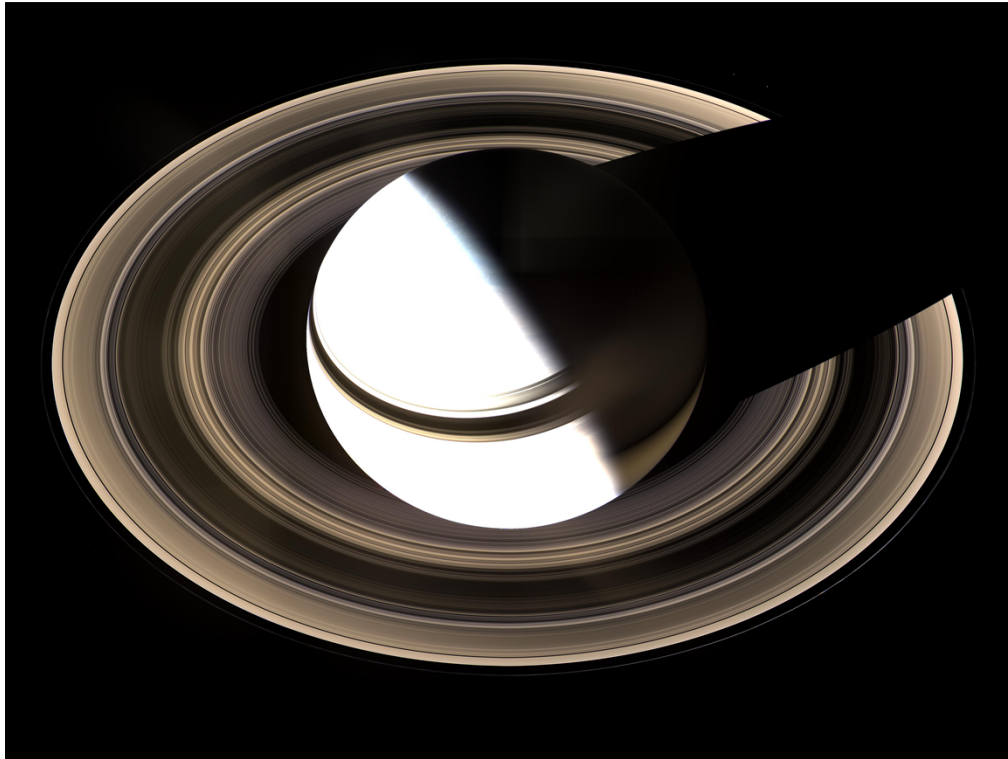
51



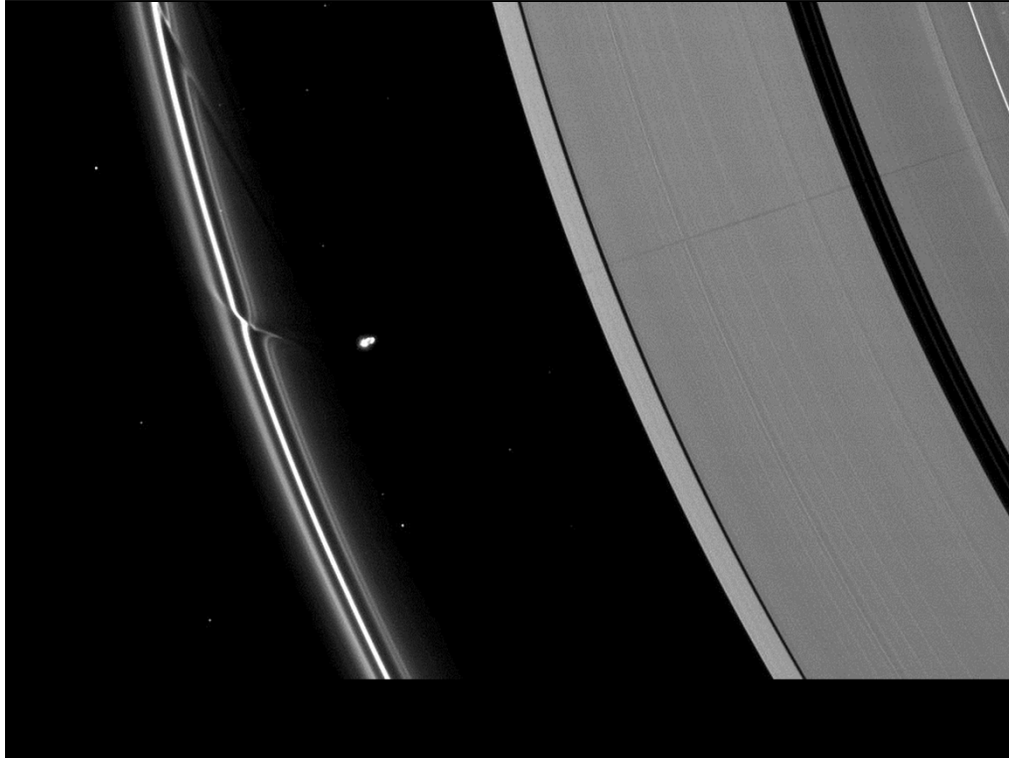
Imaging Science Subsystem (ISS) narrow-angle camera images obtained through ultraviolet, green, and near-infrared camera filters.

The original images ranged in resolution from 28 to 154 meters (92 to 505 feet) per pixel and were taken at distances ranging from 5,064 to 25,949 kilometers (3,140 to 15,468 miles) from Enceladus.

Areas that are greenish in appearance are believed to represent deposits of coarser grained ice and solid boulders. Whitish deposits represent finer grained ice. The mosaic shows that coarse-grained and solid ice are concentrated along valley floors and walls.

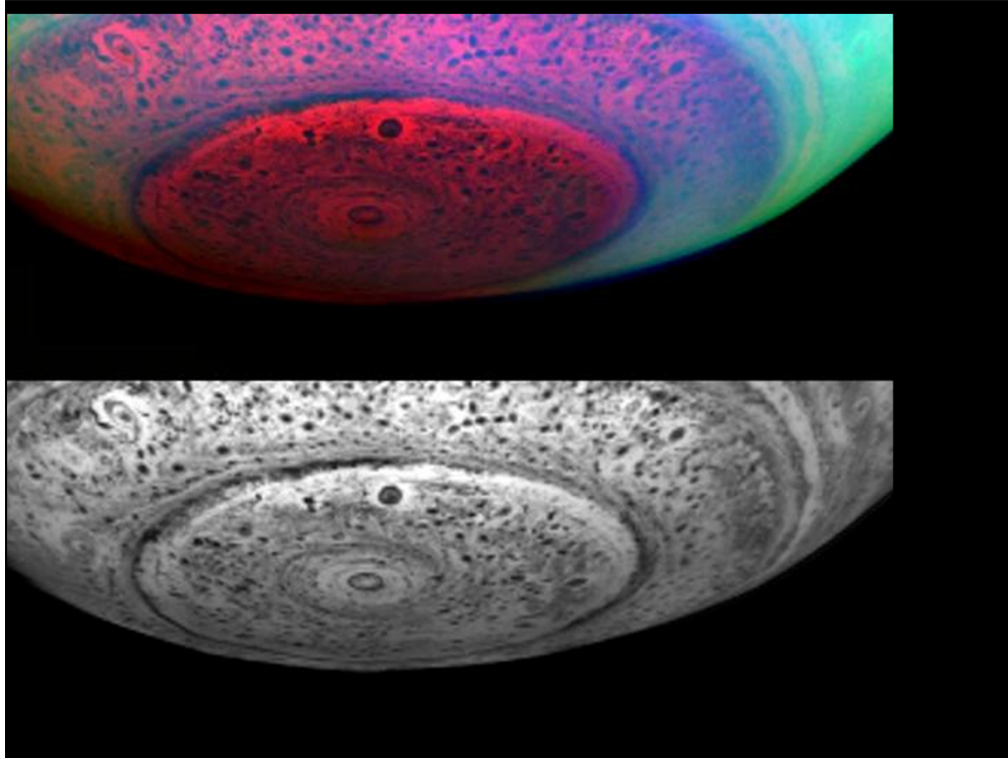


Surely one of the most gorgeous sights the solar system has to offer. Cassini scanned across the entire main ring system on 19 January 2007, at a distance of approximately 1.23 million km from Saturn. Between the blinding light of day and the dark of night, there is a strip of twilight on the globe where colorful details in the atmosphere can be seen. Saturn's shadow stretches completely across the rings in this view



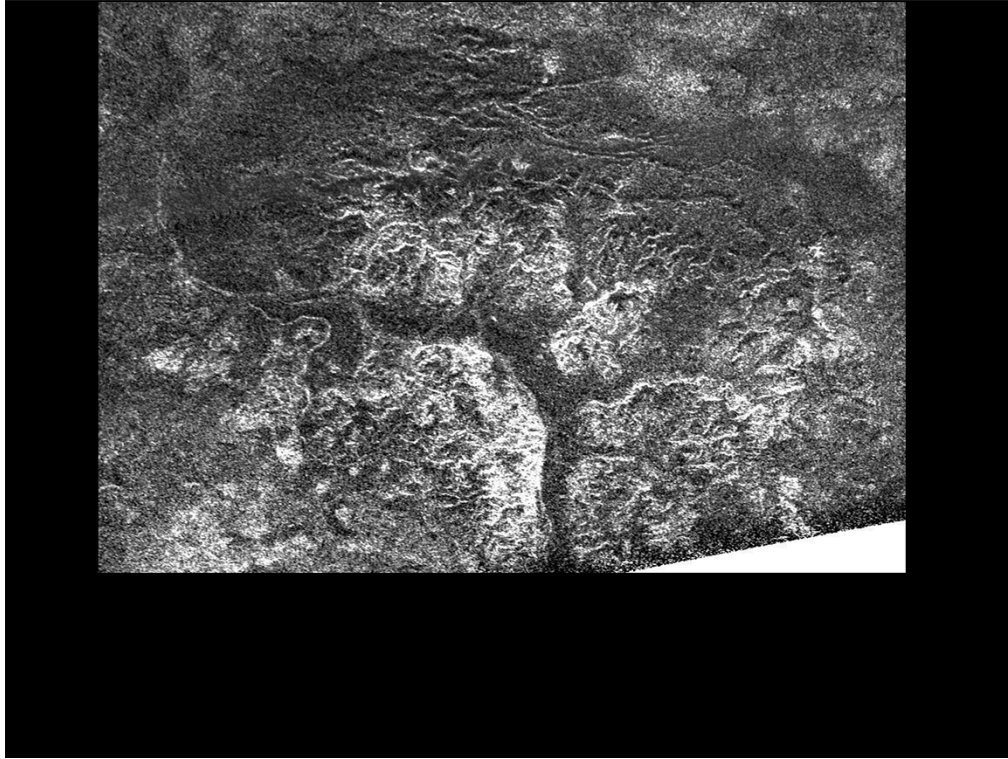
PROMETHEUSThe effects of the small moon Prometheus loom large on two of Saturn's rings in this image taken a short time before Saturn's August 2009 equinox.

A long, thin shadow cast by the moon stretches across the A ring on the right. The gravity of potato-shaped Prometheus (86 kilometers, or 53 miles across) periodically creates streamer-channels in the F ring, and the moon's handiwork can be seen on the left of the image.

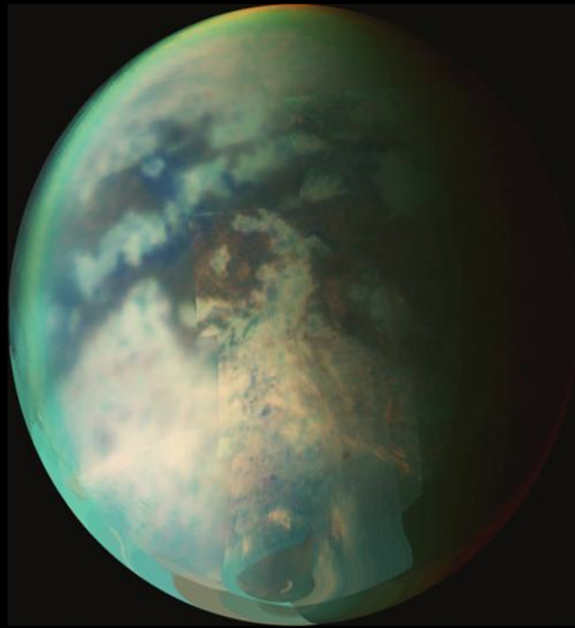


Saturn's South Polar Region Revealed October 13, 2008

These two images of Saturn show the entire dynamic atmosphere of the south polar region. Earth-like storm patterns seem to be powering this vortex. The eye of the polar vortex is bright, showing that it is nearly cloud free. Dark spots throughout the region reveal the presence of thick convective clouds lurking in the depths of Saturn



May 21, 2009 (Radar Image) / Complex and unique canyon systems appear to have been carved into older terrain by the ample flow of liquid methane rivers on Saturn's moon Titan. The channels seen here indicate that fluids flowed from high plateaus on the right to lowland areas on the left. In the center of the image, the wide distribution of the channels' tributaries suggests that rainfall is effectively eroding the surface. The bright terrain toward the bottom of the image is interpreted as high cliffs and broken bedrock. These canyon systems remind us that Titan is (or has recently been) a dynamic world with a complicated geological history.



National Aeronautics and Space Administration

Cassini

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